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15 Cents a Copy * \$1.50 a Year

Published Monthly by

Popular Science Publishing Co., Inc.,

381 Fourth Ave., New York

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March, 1033. Val. 133. Na. 3. Popular Sciente Manufally to profitated frontale at 24 Points Academy, New York, N. Y. by the Fuguatar Science Publishing Co. Inc. A. L. Chie. President and Trensurer; S. C. Witnes, View President, John Nichals, View President, John Nichals, View President, John Nichals, View President, P. W. Briggs, Ser y Statered, As a second-class matter at Dayton, Olive, Spirit, at the Post Office of Names of 187th additional entry as accord-class matter at Dayton, Olive, Spirit, Lupt, by the Propular at the Fost office trepartment. Canalla Printed in E. S. A. Copyright, Lupt, by the Propular Persons Publishing Cu. Inc. Mingle coupy, It sents (26 repus to 1 attack States and the presentation of 1 attack). Yearly advantaging the most in minuses of the next publishing Canalla, 12 Subscribbers must notify as of change of address four avoka in minuses of the next publishin date file such to give both old and new address. The reputation date file such to give both old and new address. The reputation date file such to give both old and new address. The resident of the next publishin date file such to give both old and new address. The resident of the next publishing the material of the next published artists of the return of such material of the return of such material at these next posture with the healment methods of the today during the such as a Popular Science Manuthly arrists for attach-aciling whether in never authorized.

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WHERE Amateurs Have No Standing

By LEON MEADOW, Financial Editor

DING home on the train the other night, I couldn't help overhearing a conversation between two men in the seat ahead of me. One of them tooked up from the financial section of the newspaper he had been reading and said to the other, "If I had the money I'd get in on some of that Case Threshing Stock. I've got a hunch you're going to see a hig rise in it within the next two weeks."

"I've got a hot tip on Coca-Cola-from some one who knows."

After they left the train, I set to thinking about the distorted vision that apparently sane men exercise in some affairs.
Here were two men who, from all appearances, were evidently well-to-do and moderately successful, and yet their talk on
investments wouldn't do credit to a sixteen year old boy.

I suppose it is one of the peculiar twists in a human being's make-up that accounts for the fact that intelligent people will tavish great attention and caution on minor things, and yet undertake many important operations without so much as a thought to proper investigation or expert advice. The woman who will spend an entire day selecting the right pair of gloves, may enter into a life companionship without knowing the man she accepts as her husband. The man who is fanatically particular about the ties or shoes he buys, will often purchase a bome because be likes the special closet built for housing his golf clubs, or for some equally trivial reason.

In no field, however, is an unbalanced set of values so prevalent as in the purchase or sale of securities. Yet, there is hardly an undertaking which requires so much general and specific knowledge as does the problem of investing. Because any man or woman who has the money can go to a broker or a bank and order whatever stocks and bonds they want, many have come to believe that they can entrust themselves with the exchange of their capital for securities.

TO THEM, perhaps, it is the same as putting to sea in a frail sail-boot, and without any experience in navigation, simply because they have enough money to may the boat. Psychologically, it isn't hard to understand. Man's very ignorance alone is enough to make him overlook the difficulties of any given venture. Viewed from land, nothing seems easier than sailing a boat. When you're on the ground, an

airplane landing doesn't seem to take particular skill. In a similar manner, and until one learns to the contrary, buying stocks and bonds and holding them until they go higher seems like child's play. A review of the last two years should settle that delusion.

The price, value and safety of income of any security is determined by countless direct and indirect factors. The disturbed conditions of things today is evidence enough of that statement, although it must be admitted that some of the influences now are more pronounced than usual. Yet, these influences, in one form or another, are always with us as actual or potential factors that affect our investments. International, national and local finance and politica, scientific progress, social changes and developments, style trends, spending habits and popular tastes, international trade, interest and discount rates, balance of payments between nations, seasonal weather, crop results, migration, competitive conditions in industry, managements and a veritable host of other factors, hig and small, play their separate parts in the valuation of any security, as viewed from an investment standpoint.

IN OTHER words, judicious investment is a problem that demands of any man as much time as he would ordinarily give his own business. Any man who attempts to do justice to both, must do so by compromise-and then one or the other, and most likely both, are bound to suffer. For investing not only requires a man's full time in following all factors mentioned, but it also demands that he be an expert in quickly selecting all the pertinent facts and figures from the various and involved financial and statistical services, trade and newspapers, government reports, etc. Even then, granting that he finds the time and facilities for doing all this, it will be of very little use to him unless he has a broad background of experience in snalyzing financial statements, economic reports and treatises, in determining the trends and meaning of markets, and in drawing the proper conclusions, a faculty which often calls for unusual vision and a highly developed sense of values.

Furthermore, a man who possessed all these qualities would find it impossible, if only from a standpoint of time alone, to cover the entire field, and it would be necessary for him to engage qualified specialists for appraising values in the main groups of securities, such as railroads, public (Continued on page 7)

Copyrigment relations

WHERE AMATEURS HAVE NO STANDING

(Continued from page 6)

utilities, manufacturing and mining, nunicipal and foreign government bonds,

All of which makes it pretty evident that the average citizen, without the knowledge of a professional analyst, cannot be expected to handle his investments with any degree of efficiency and success. The financial world is no place for amateurs and no one seems to have realized this so thoroughly as a great many wealthy and successful business men, or so-called "big investors," These men would not think of entering upon any investment program without proper assistance and advice, even though, as a rule, they undoubtedly have more investment experience and better access to sources of information than the average small investor. And yet, obviously, the small investor stands in far greater need of well-balanced, experienced advice than his more fortunate big brother.

THAT being so, what makes so many investors, including some of our more well-to-do ones, turn away from the idea of adequate investment help? Here are three reasons why:

- It is human nature to be independent, and to do without the aid of others whereever it seems unnecessary.
- The expense of a fee for investment advice is looked upon as an expense item and, therefore, as a loss.
- J. Ignorance of how or whem to select as a counsel, and fear that even the adviser's judgment may prove incorrect.

Let's take up these three points in order and see if it's possible to iron out the wrinkles. First, independence is an excellent thing, but not particularly practical when exercised at the expense of efficiency and success. The character of investments often spells the difference between financial security and loss of everything, the difference between comfort and poverty. It is therefore too serious a thing to play or experiment with, too dangerous a charge in the hands of an amateur. The sheer luck of a few who have gained temporary success in handling their own investments should be a warning to all others who remember the old saying about rules and their exceptions. One might as well disregard the services of proper and qualified medical or surgical attention because there are cases when laymen did the right thing in emergencies. Judges will tell you of men who successfully defended their own cases in court, but for everyone who did, ninety-nine, who dispensed with lawyers' services, lost the decision. Be independent about decisions you know are qualified by experience or knowledge to make, but don't overlook or belittle the help of those who know on affairs outside of your field.

Second, the expense is comparatively small. On an investment fund of \$50,000 the fee generally runs no higher than \$250. a year, and is proportionally lower or higher according (Continued on page 4)

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(Continued from page 7)

to the size of the fund. This represents a fee of one-half of one per cent, or a sacrifice of less than one-tenth of the 51/5% which may be taken as the average return on an investment portfolio. We use the word "sacrifice," but it should not be looked upon as that, Experienced advice, which is instrumental in preventing losses, is cheap at any price, and all the more valuable when it belos create capital and income profits which may more than offset the fee by several times. Many a man who thought he could save investment counsel fees by handling his own investments, has since learned the meaning of "penny wise, pound foolish."

Third, investment counsel, being the product of human intelligence and ability, is liable to error. It would be foolish to think otherwise. But that is a poor reason for condemning all investment advice as meless. The fact that lawyers, doctors and engineers sometimes make mistakes hardly makes their service the more dispensable. People who would build their own skyscrapers and automobiles because architects and manufacturers make mistakes, are fit subjects for the insane asylum. As for the man who insists on guaranteed perfection, he will at last come to a point where outside advice or aid cannot be had, and in the meantime he will have done himself irreparable harm.

THE selection of the right investment counsel can be made by applying a rule which also applies to many other things, Look only for the best, since a generally uniform basis of fees puts all investment counsel services on a parallel where expense is concerned.

The successful and reliable investment counsel can be located in the same way one finds a good printer or tailorthat is, by referring to their clients. The good ones will rest their case on the word of their customers. Most probably they will be serving an old, satisfied clientele, and will not depend on a large or frequent turnover of subscribers. If they advertise or sell their services through salesmen, they may be aggressive and convincing in their claims, but they will not set themseives up as cure-alls or state that they have made millionaires overnight out of small investors. They will emphasize strongly the need and desirability of a properly balanced portfolio of boldings; they will stress conservative methods of investing. They will discourage gambling, and present the long-term viewpoint rather than the day-to-day fluctuations of the security market.

There is no magic formula for selecting the right investment counsel. It rests almost entirely with a person's mental ability and strength of decision to detect and withstand the exaggerations of high-powered salesmanship. Your own common sense must in the end determine the sincerity and truth of facts, as presented. Those are the only rules for choosing an investment counsel worthy of your trust and of the nominal fee you pay for guarding and protecting your (Continued on page 9)

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WHERE AMATEURS HAVE NO STANDING

Continued from page 8)

money by means of his experience and investment talent abilities which are gained over a long period of years in the hard school of investment training.

There is one specific guide-post that everyone can follow in choosing the proper investment counsel. Whomever is selected. tet it be a man or an organization with nothing to sell beside their services and experience. Men or firms interested directiy or indirectly in the sale or purchase of specific securities are too apt to recommend what they want to acquire or dispose of at advantageous prices. By the very workings of human nature, these people cannot be unbiased. Stick to the man with an advisory service only. One who is not, in addition, a security dealer, a stock manipulator or anything else which might cause him to be prejudiced.

To Help You Get Ahead

THE booklets listed below will help every family in laying out a financial plan. They will be sent on request

The Investment Aspect of Life Insurance, by M. A. Linton, presents life insurance as an exceedingly worth will investment as well as a form of protection. Provident Mutual Life Insurance Company, of Philadelphia, Pennsylvania, will mail a complimentary copy upon request

Before 65 and After explains the fair acts is of a Ret rement Income, with fall Life Insurance, Disability and Double Accident benefits. Sent on request by The Equitable Life Assurance Society, 393 Seventh Avenue, New York City

How to Get the Things You Want tells how you can use insurance as an active part of your program for getting anead financially Phoenix Matual Life Insurance Company, 328 Elm Street, Hartford, Conn., will send you this booklet on request.

See How Easy It Is tells how it is possible to start off with a definite plan for creating an immediate estate leading to future financial security. Get your copy of this booklet by writing to Postal Life Insurance Company, 511 Fifth Avenue, New York City.

"You Can Have An Income As Long As You Live," a booklet describing samply and clearly how the Annaty can be used to provide a guaranteed income for life. A copy will be sent on request to Inquiry Bureau, John Hancock Mutual Life Insurance Company 197 Clarendon Sereet, Boston, Massachusetts.



General Electric MAZDA Sunlight Lumps Give Useful Light Plus Adequate Ultra-Violet

Accepted by the Council on Physical Therapy of the American Medical American

Notice this Manny Scalight Lamp. A pool of mercury in the both for me in "mercury input are" rich in ultrability. Coughly are for home terrors may with Manny Scalight Lamps Park with pateral numbers. The Manny Scalight Lamp, Type 5-2,

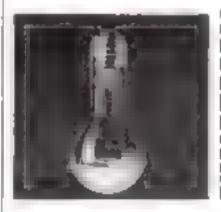
at a distance of raymy law in his gives you the oliver unlet equal of oil and making making and good facilities allowed and provide Soungel Lawy serves a choose persone. Mail congan below for your free copy of "The ladger Soun."

Matte Sunlight Lamps (none call them "botto") rain not be accessed into a postancy sucked They require special futures. Look for the oral when you hay a fixture. It indicates that a matter future made by our of 8 marginarticers has been missed of the General Electric Company propolitic.

It has been tested and appeared by Clean for disconniction are after valid effectiveness when used with the General Licetite Manna Suntight Lang.

Look for this Approval Seal





GENERAL ELECTRIC Nota Park, Geveland, Olio	
Please acts me free copy of	The Indoor Sun."
NAVE	
Арокен	

GENERAL & ELECTRIC

Our Readers Spring This on Your Friends And Maybe You'll Lose Them HERE'S one that's been bothering me for

a long time. Some of your scientific resource probably know the answer Suppose we take a compression spring, like the valve spring on an automobile, compress it, and then bind it with wire so as to hold it in com-

pressing. Then we drop it late a container of strong acid, Taking for granted, of course, that the acid will eat both the compressed spring and the binding wire at the same uniform rate, what happens to the estergy atored in the



spring when the whose business has dissolved? The law of conservation of energy, they tell me, says that energy can neither be created or de stroyed It has to go some place. What happened to it? In it transformed into heat?

-H J P., Baltimore, Mcl.

Magnetic Field Accounts for Your Jumping Ring

HERE is my explanation of the jumping ring problem recently submitted. The size of wire or number of turns will make lattle cafference. The ring will Jump away because of magnetic action. Two like poles will repel each other. The ring of wire when placed near the coil with the current thiwing through it, will have induced in a, by transformer action, a current opposite in direction to that in the primary coll. This current will proluce a magnetic field around the coil. The ring, boing on the iros core, will then be thrown away by the action between these two magnetic fields set up by the two currents.- R.G., Utten, N. Y

See Page 68 for New Ideas in Square-Knot Work

In a recent usue of the Popular Science MONTHLY I was very interested in the article about knotted belts. I learned haw to make them and have made about a dozen of them so would like to learn some new putterns In the article it said if one were interested in finding out more about them to write to you. So will you please send me any information you might have to give.-L.T., Honolulu, T. H.

More of This, More of That; Now Chemistry's at Bat

lat A recent issue of Popular Science MONTHLY, I read a setter from one of your Australian readem who wrote that he thought there should be more chemical news in your magazine. I write this to say that I agree with him and



to ask you to stick to your name of Portital SCIENCE MOSTHLY .- C.A.R., Woodmere, N.Y.

If the Poison Gas Fails, the Bombs Will Get You.

TELL me, is it true, as some chemist recently said, that "skyscraper cities" have little to tear from wartime attacks with poison gas? According to this chemist all gases so far used lose their effectiveness thirty feet from the ground. Rooms un the upper floors of tall buildings would thus serve as safe refuges from a gas attack. That's all very fine, and I suppose it ought to make un city slickers feel perfectly sale. But what about bombs? A few of those dropped here and there might make a towering gas retuge a mighty uncomfortable place What? Will some one please tell me how to escape that danger?-C A S., Chicago, Ill

Wanted: Colored Lights for His Tamed Fish

I am purting this problem before you in the hope of receiving, from your vast experience, the desired information. I am quite an amateur at artistic ornamental fron work, having learned this art from my father who was a real artist in this and New I am making for my little old bome a nevel type aquarium and flower stand combined It is partly completed but the idea struck me to

incorporate, more for originality than for anything else, (you know, I crave origof changing colored oghts under the bowl i am in hopes you can belo me either with definite instructions or by dire one me to the proper parties who will tell



me how to arrange and install the lights Can I count on you? I am also greatly interested in all thiogs ornamental, especially if they are of forged metal.-G.F.M., Mariners Harbor, N. Y.

All Right, Mr. Wailes, What Can You Do About This?

Can you or any of your readers give me the necessary information for making a chemical garden of about twelve different varieties of chemical growths? Water glass is the main incredient, as far as I know. By the way, I'm starting a chemistry laboratory and therefore agree with all readers who say your marazine needs noth no but more chemstry articles.-- H.L., Phillipsburg, N. J.

That Expanding Soap Bubble Geta Caught in Calculus

Ir A.P.B of East Lynn, Mann, expects his soap bubble problem to be solved without a knowledge of calculus he is quite right in saying that many long winter evenings may be whiled away in doing so. I have found the answer by a method which I believe cannot be besten for brevity, but if there

is now other was shorter or longer, I should like to know it. My answer it 0.00708 inches per second or 0.425 inches per minute. What is yours? I can prove my apswer if necessary. Give us something hard, you mathematicul witarch !- R E E., Baltimore, Md.

One Extra Rib May Mean More Blubber for Eskimos

I see by the papers that Eskimos are getng an extra rib. An examination of 200 Eskamo skeletons, it is said, showed a goodmany of them with twenty-five ribs instead of the normal twenty-four. The ducovery

is regarded as proof that evolution is stil. going on among this race. [wish some of your bright readern would tell me what good this rib will be after they all get it. Will they be stronger, able to ext more fat, and lew likely to amack down their wives



and best up the children? Is it possible this rib stuff in the result of prohibition? That might be a good angle from which to attack the problem .-- Q O., Cleveland, Ohio.

Cutting Precious Stones Looks Like a Good Job

I am desirous of securing information about the cutting and polishing of preclous stones, such as agates, agatized wood, or opals. I would ake to learn where machinery for such work can be secured and what the approximate cost will be. Can any reader tell me if there is a market for such stones after they are polished and whether a man of sixty might michy undertake such a line of work? I realize that this is rather a large order. Possibly somebody can refer me to something already published that will answer my questions. I am a regular subscriber and prize the paper very highly. It is a tonic when I am over wrought with my regular line of duties.—(Rev.) J.F.W., Botse, Idaho

Here's a Problem That Is Just the Bee's Knees

You evolutionists might pender this one When a bee goes into a flower, its breathing

apparatus becomes To placeed up open it again, the bee has brushes on its knews which he uses after he crimes out of the flower OTELDIC evolution save that as new needs arise, new organs are developed to take care of them in the



case of the bee this process seems to fall

down. Isn't it apparent that the first bee ever born would not have discovered the need for brushes until after it had gone into the flower and its breathing apparatus had become plugged? It would then be too late for organic evolution to come to its rescue So what?—R.K., Detroit, Mich.

Jig Saw Puzzlez That You All Can Make

As a subscriber of your magnine for several years, and enjoying it very much. I have often wondered what use I could make of the very interesting cover on each months

tssue. At last I have thought of some thing that seems excedent to me Cut the cover from the book and glue it upon a three-ply veneer board. Then cut out pieces of various sizes, shapes, and designs with a jig saw. Thus the tovers can be made



into interesting and instructive fig naw purzles and many hours of pleasure may be had by every member of the family is arsemoting them. Won't this idea interest your readers?—CFB, Floral Park N V

Lost on The Teal of Energy. He Yells to You for Help

My many is on this question of matter and energy and it has become so mixed up in my head that I am calling on you and your readers to help me out. They tell me that matter cannot be created or destroyed and the same thing books true for energy. But in the case of the radio-active elements, a certain portion of the matter contained in them goes off in a state that is neither matter nor energy. Why is this not destroying matter? Why not give us readers of your magazine a tip on the relation of energy to matter so we can stay straight on this question of creating and destroying things? I would really enjoy such an article, I think that you have the best magazine of its kind on the market—M O.M., Naskville, Tenn

He's Trued Them All And Your Magazine Leads

I HAVE been receiving your magazine for several years and I want to tell you that I enjoy it very much and look forward each month to its arrival. I have read practically all the magazines of this type and can my without any hesitation that Popular Science Monthly surpasses them all. I would very much like to secure working drawings for a quilting frame. These are not listed but I write it case you may have them or expect to have them in the hear future—C.H.B., Sewickiey Pa

For Inventors Only: Three Big Ideas

ARE you still keeping your famous book,

"What's Wanted," with a list of needed aventions? If so, here are a few that I'd like to see adord I A topacto humidor that actually keeps tobacco humid. 2 A bed that makes itself (I almost solved this myself—but its still in the paper stage!)



in the paper stage!)

3. A Sunday newspaper with sofficient force of cobesion to keep
its sections from scattering to the remotest
corners of a house,—P.R., New York City

Helpful Hints in the Study of the Speed of Light

IN A recent issue of Popular Science, MONTHLY John L. County describes the eflorts to determine the exact speed of light. He says that there is a variation of fifteen zailes per second from the old determination and that the reason is unknown. He says nothing about the possibility that this variation may be due to the fact that the old determination was obtained from experiments in air, while the new was from experiments in a vacuum, or a near vacuum. From the article it would seem that this has been over looked. With the equipment described, it could be determined whether this variation to due to the vacuum. Could that be possible? I have written this letter on the supposition that all of this may have been overlooked, and if so, you can call it to the attention of the experimenters who could then make needed corrections.-L.L.L., Waterloo, la

Surgeons and Their Work Win His Admiration

Having finished the temarkable article on "How Modern Surgeons Conquer Fatal Germs" and connected it with "Triumphs of Surgery," I am filled with admiring wooder I wish to approve to the fullest extent the statement made by H t 5 that it's great stun, and I ton with eat up every article for Damray writes. In addition, I would like to say that every respectable doctor and surgeon of the world should be looked upon by his fellow citizens as one who has endured many trials and hurdships in his desire to aid mankind.—W F D G., Oregon, Mo.

Aspiren Works Meracle

A JONE of we thought? But it was a stressver for the gordish. We returned home after a week-end away and found one of our groudsh floating literily in the bowl, appar

ently dead. I picked it up to dispose of it but the had sister stopped me she wanted to try an experiment. She took the it he and paced too a small jar of water in which an aspirth had been dissolved. The next morning the fish was withming around as



healthy as ever. And he is still very much alive. Moral. If your goldfish neemingly dies, give it an aspirial. It may come back to life.—C J C., Buffalo, N. Y.

At Least One Spider Web Blew Across Wide Gap

Pranaes MOM 3 to show terophine a spider will an a recent issue of Post Ak Science Mentitive may had an answer in near a mountain in Pennsylvania 1 webup to the top where a large tree stood in the open, about one hundred feet from the edge of the forest and lay down in the shade At I lay there looking up I saw, glistening about thirty feet above me, a long spider web, a single strand. A light breeze was blowing from the tree toward the forest, as I watched, it grew longer and soon a post of wine took the loose end high in the air and as it came down it rested on a limb of one of the trees. Boy fashion, I bunted for a stick to theor up against the glistening thread. I did not find one so I returned to look at the thread and to my astonishment there was a sputer creeping along on the under side of it. I watched him until he reached the tree to which the gord was attached. I

am now ninety years old and this happened long ago but I do not know what became of the spider.—(Dr.) H.A.D., Madison, Wisc.

Follow Our Articles And You'll Learn How

Your articles dealing with the necessary equipment for building a model railroad have been very helpful to me Following your ideas, I now have a fairly good railroad layout. But now I'm stuck with the most important fea-



ture of the entire system missing. I have no spend system. I hope you we explain to me how to make my trains stop automatically M.Y., Brookeyn, N.Y.

"More Than 100 Per Cent" Strikes Him As Too Much

Uveza the title "Explosions Drive Gant Turbines," I noticed the statement, "by the use of explosion boilers it is possible to extract more than 100 per cent of the heat that the fuel theoretically contains." I object leven it the exhaust gases are discharged at a temperature lower than the surrounding air, that, in my opinion, does not imply an efficiency of even too per cent, to say nothing of an efficiency of more than 100 per cent. The matter above absolute zero, which is 273° below zero on the Centigrade scale and 456° below erro on the Farenhes, scale, contains heat. Now, to estract more than 100 per cent of the heat the fuel contains, the exhaust gases would have to be expelled at a temperature below absolute zero, which is impossible. Scientists have not been able to reach absolute zero in the laboratory, they have, I might add, reached a temperature of 71" above absolute sero, as I recall it. In concluding my objections, I will say the statement in the article also violates the first law of thermodynamics, which simply is one of the many applications of the conservation of energy-energy cannot he created or destroyed, but only francormed or converted -THR, Gardner, Mass.

Measure Them as You Will, They'll Run Just as Fast

Way should the managers of athletic af fairs have more brains than the rest of us? While we struggle along with feet, yards, and rods, the Ameteur Athletic Lauren has adopted the metric system of measurement (or all future track and field events that it sanctions. Now American athletes can be rated directly in comparison with those of other countries. The metric system, simple to learn and use, is anotherns to Americans Is that sensible?—A.L.B., Springfield, Mo

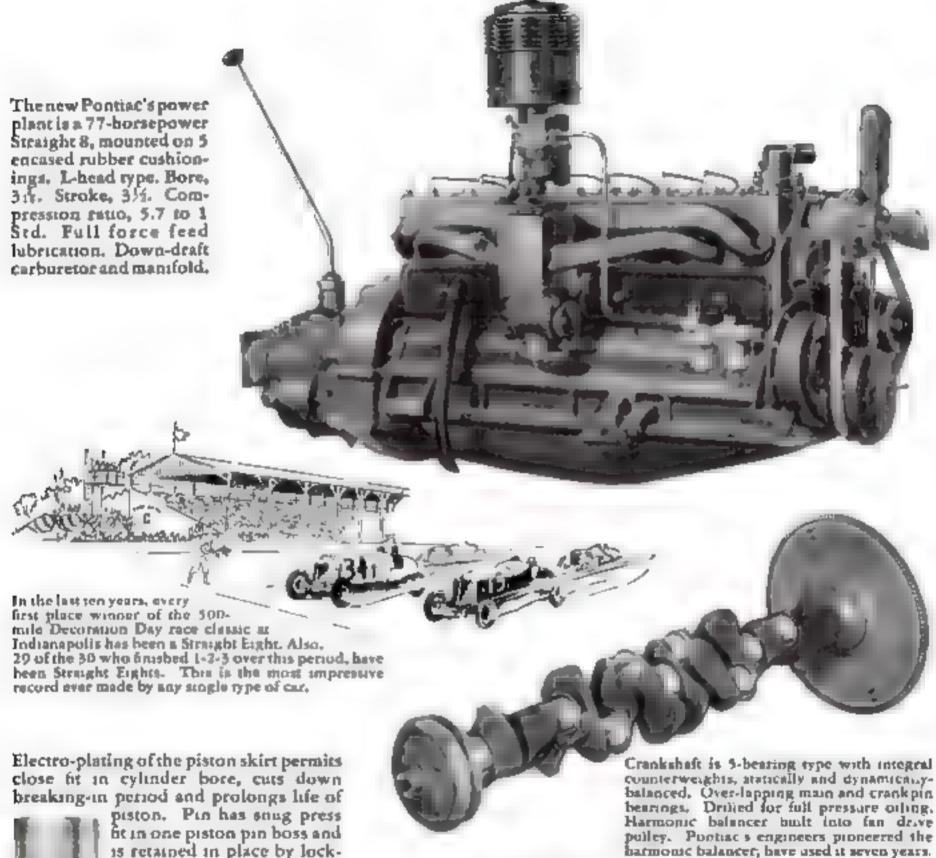
How About "You Win" and "Here's The Ten I Borrowed?"

Picking out the ten most beauciful words in the English language steam to be becoming a new fad for dictionary lovers. Why not a list drawn exclusively from the field of science and mechanics? Here are my choices Dynamo,



momentum, crystal, beryllium, diatom, fluid, turkine, capillarity, incandescent, electrotysis. Do I bear any other nominations?—H.R.F., Paterson, N. J.

Pontiac perfects the Economy STRAIGHT EIGHT



is retained in place by locking screw. Opposite end of pin slotted, with light press fit in boss. All pistons ma-

> chined to uniform weight within 16 ounce; pins casehardened and ground to .0002 inch tolerance.

Y more than just a matter of low first cost and easy gas and oil consumption. It s also and mostly -a matter of long life and freedom from servicing expense. The less strain there is on each and every part of the engine, the less chance there is of wear. With eight cylinders Pontiac produces 77 horsepower with a third less strain on each part than if this power were developed in a Six. A. speed of 78 miles an hour is developed. This Straight 8 engine is designed and engineered to give a maximum of service-free operation -and to consume a minimum of fuel. See the big, low-price Pontiac Economy Straight 8—a General Motors value—at the nearest dealer's showroom. Examine it carefully. And if you want still more information, write to Pontiac, General Motors Corp., Detroit, Mich., for literature. No obligation. Just mention this magazine.

JOU men interested in things mechanical know that economy is



POPULAR SCIENCE

MDNTHLY

March 1933 Vol. 122, No. 3







Riding the Night Patrol



From \$101, on WPEG, this announcer Edward Barth pends our warnings to the lad o cars. At top of page the men of S sty-five and a precinct car attack a gang

adio Police

EDWIN TEALE

ED blue green the reflections of neon signs race across the polished bood of Cruiser Car Number 65 Private cars swerve to the rurh. Crowds flash past. Lighted windows blur and streak together. Cross-street traffic stops as the wail of the siren announces that the night radio patrol is usaking a run.

For eight thrill-packed hours, one night recently, I rode on radio patrol in the heart of New York Calv First hand I saw he amazing precision with which this newest machine functions in fighting crime.

We went in a big gray car, listed on the police rolls as Sixty-five, It looks like a rich man's limousine, but under its soft cushions are builetproof vests and tear-gas bombs. Over the back of the front seat is a stubby harreled shotgum, loaded with steel slugs. In a rack on the rear floor is a special battery-run nearchlight with a beam that reaches a quarter of a mile. It is used to pick out burglars fleeing over rooftops



others W. Lam Kennedy crack driver Frank Waldron, pencil in hanc 🕖 he record of rail a casts on a year

Bernard Salamone, expert with the sluggun. Courteous, efficient, heavy-shoulgered. Dolan has been on the New York force nineteen years and his companions are picked men who have ridden radio patrol since it was established early last year

Over our heads, the steady metallic crackle of static comes from a gold-colored loudspeaker, the suce of a dinner plate, set in the ceiling. Above it, buiden in the roof of the car, are fifteen square feet of copper mesh, forming the aertal. The set is permanently tuned in on 122 5 meters, the wave length of the three New York ponce broadcasting stations WP FG in Manhattan, WPEE, in Brooklyn and WPEF, in the Bronx

Suddenly the static is drowned out by the sustained, ear-prescing note of the 1000-cycle attention call of the New York station. Then a metallic voice

"Calling cars 507, 561, 1080. Go to

Sixth Avenue and West Eighth, Code Signal 31 Station WPEG

Waldren winds down the window and listens. For away, above the pure of our engine, we hear the rising wall of three sirens as the radio cars converge on the comer indicated.

"There they roll," says Dolan and Waldron closes the window

To avoid delays in transmitting instructions, code numbers are employed to indicate the nature of the crime. Thus, 57 means investigate suspicious persons, 31, arrest for felony dangerous persons, be cautinus, and 30, the "dynamite call," indicates a holdup, burglary, shooting, or naurder Every run on the New York Radio Patrol means a major crime or the possibility of one.

The only exception to that rule, of which I heard, occurred under dramatic

circumstances. A famous surgeon, the bight before my ride, was wanted to perform an emergency operation. No one knew where he was, except that he was riding somewhere in the city in his nutumobile. The number of the machine was flashed from WPEG. In fifteen minutes, Sixty-five spotted the car and the nurgeon was speeding to the hospital.

Five square miles of teeming city life comprise the hunting territory of our car To the men beside me, as we wind in and out of dark side streets, almost every block recalls some crime in which their car has figured. They are grim, strange tales of a world that comes to I fe while the city sleeps

Here a negro, shot through the chest. ran across the street and fell dead in the doorway of an undertaking parlor, There a gangster was found in the gutter with two pennes lying beside him, torsed down as a final gesture of contempt by his slaver. Up there, where a dun light burns m a dingy house, an old woman was mysteriously strangled, four nights before In a single week, not long ago, Cruser Car Sixty-five cleaned up five stickups, three burglaries, and two murders, arriving at the scene of the crime in one case tess than a minute after the alarm went on the air

Reception is best along the waterfront We eatch faint broadcasts going out to factor is in other cines, in Indianapolis In J. Detroit, Mich. Miswaakee, Wisc. We hear a startering dot-and-dash message from a shor wave set at sea buwhen a local call goes on the air, it drowns out everything else.

We are leaning forward to catch a fain. broadcast to an Indianapous car, when Bee-e-e-pl Calling cars 1007, 1005

45. Four persons in a blue sedan with a New Jersey license parked between Tenth and Eleverth Avenues on Fifty-six-li-Street. Be careful, They may have guns Signal 31

In front, Waldron's pencil scratches across the yellow pad. Bestde me, Dulan says, "All right, Bill Let's roll.

The big car speeds up, kennedy press en the black button that throws the siren into action. We are on a straight run of more than twenty blocks, past dark warehouses, staring crowds traffic huddled at the curb-

We roar through red lights at forty rules an hour Then, near the end of the run, the stren stops. We are slowing down.

ERE is the first authentic story of the work done by the radio cars of a big city. Through the courtesy of the Police Commissioner of New York, the author spent a night in one of the big cars gathering the facts that make this one of the most remarkable articles of the year

Saxty-five slides to a stop, and we jump

out ready for any emergency

Two other radio cars, small blue-green two spaces are already here In the cistrict enveren by Sixty dive here are a dozen of best precing wars known to the service as Dolly Sisters. Most of the 300 machines of the New York radio fleet are such precinct cars. Less than two dozen are but ace cruser cars, each manned by four detectives. In the race to be first on the spot, the Dolly Sisters usually win, having smaller territories to

Three men and a woman are climbing out of the blue sedan. A suspicious neighbor phoned the police when he saw them sitting in the car for an bour watching the apartment house across the street Their story is that they are waiting for the janutor to come home. The woman explains she has a fortune in twenty American banks but can't get a dollar out. She believes the janutor, whom she knew "in the old country," can belp her Just then, the janitor arrives. He takes the detective aside and explains the woman is an old friend, not quite right in her mind, but entirely harmless. Dolan phones has report back to the broadcasting station. Then he climbs into the car shaking his head

"Join the police and meet queer peo-

ple," he says.

As we swing slowly north the hands of a huge electric clock point to 8 15, Hoth local and out-of-town calls are speeding up. All over the country, crime is rearing its head. The beeps come in rapic succession. Burglars are on the roof of a store in Staten Island, across New York Bay. An insube man with a backjack, is chasing his wife. There is a race riot in Harlem, a stickup in the Chetto. Every five or ten minutes, local flashes send the cars shuttling back and forth from one part of the city to another

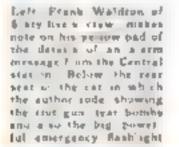
The busiest time of day for the radio patrol is between eight in the evening and three is the morning Nearly half of the 100 ca is a day go on the air during those seven hours. The quietest time is from four to eight A. M Sundays and Mondays are the quietest days. But toward evening on sweltering summer Sundays things pick up. Citizens teach a high point of Jumpiness then and the radio cass are kept on the run bunting imagenary burgars and sowing crimes that never happen. The big days of the week are Fridays and Saturdays, payroll days when holdups are likely However when it rains, there is a drop in the number of stickups. Crime that rides on rubber tires doesn't reliab s'appery pavements

> ing lote action in rapid spurts as we head east and then turn sou h ! can visualize the acene back at WPEG the jingling telephones, the flickering dials, the slapof heavy relays, the rows of glowing tubes, I can picture Edward Barth, announces, flipping up the tiny black lever that sounds the attention note and then speaking rapidly into the microphone; Joseph Martha, green eyeshade cocked on his forebead, jutting down he record of every broadcast in a big black book labeled 'Radio Patrol Biotter," Charles Hilkemeter, bending above the glass-topped dispatcher's deak, turning over brass markers cach time the cars are sent on a run

Our laudspeaker is go-

For seven hours, the night before. I had (Continued on page 103)







Blading noiselessly abreast of a suspecious machine, the police car curs in as a sharp angle sheed of it, foreing it to stop or ross into the curb. A metal plate, beating the word. Police is abown

• BIRTH CONTROL Restore Wasted

WO weeks before poilen began to fly, a young tree scientist cambed high into the branches of a vigorous Western Yellow pine. At his waist hung a hundred small bags. Over the topmost pannacle he shipped the first bag, tying it carefully so he could see the blossom through the oblong celluloid window

Down the tree be worked, quickly fastening the sacks over other blossoms until he had bagged the entire tree. Then on to other trees, climbing and bagging until many trees looked as though they were wearing ten thousand tiny rightcaps,

"What," I asked, "is the idea of that?" At the Institute of Forest Genetics, fifty miles east of Sacramento, Calif., and in nearby forests, men were doing queer

things. Some bagged pine trees. Others sat at low tables with adding machines calculating the growth of tiny seedlings Still others were in the field, obtaming cores of grown trees, searching for hardy parents from which to reproduce their young under scientific control and the most painstaking observation.

The idea, as Lloyd Austin, Director of the Institute, explained, is simple. They're developing trees that will grow eighty feet tall and to a diameter of sixteen inches in twenty-five years, instead of the fifty to sixty-five years now required; producing s ock for forests that will be hard, stronglibered, nearly disease proof, knotless. And the bagging of pine trees is an important step in the process.

During the flowering season," Austin

told me, "the air in a sine forest may be literally filled with yellow pollen from the male thowers or catkins. Handeeds of trees will be represented in the gold en pollen on a windy day. We want to control polimation both as to the male and the female parent. For the female, bagging does the trick; for it keeps day the flower opens.

Andrew R. Boone

male parent is obtained by gathering nearly ripe carleins drying him and shaking in a tight container. We subject each lot of pollen to a rigorous germination test. Incidentally, it has been discovered that pane pollen will retain its vitality as long as a year and can be shapped long distances. In fact, we have used poilen of panes na ive to India, China, Guatemala, Cuha, and other distant countries. The entire world is heijing us produce super

trees for our forests."

But this is only part of the story The proceless golden yellow dust having been collected, it must be injected into the protective bag so that the open flower may partake of its vitality. Again, up the trees go the several assistants, steriozed hypodermic needles in their hands. A glance through the window reveals whether the flower has opened sufficiently. A quick thrust through the fabric, a squeeze of the rubber bulb, and enough of the yellow dust enters the bag to guarantee results. The operator covers the tiny hole made by the needle with a small piece of adbesive lape and moves on to the pext

Danger stalks these men as they go



Yel ow pine seedlings are of the same age and were grown under dental conditions The one on the right was selected from fast growing. wood-praducing stuck As you see, it a nearly twice as tal, as the one at the left and is not was ng its vitalay. in worth res to rage

These two Western

2FT

In this section of the true ishoratory right 1.060 separate plots contain seen Irom 765 Western Ye low pines It s in such carefully guarded plots that atudies ate made of the various qualities of parent stock

METHODS

Forests

control methods to embryonic trees, for much of the polanization takes place a hundred feet above the ground. To scale such a tree the worker often wears spiked climbers; and safety belts do not whosly eliminate the thrills of working for above the earth in a swaying tree top. Excitement often attends the gathering of seed, in fact some cones are found to be so maccessible they are brought down by well placed ride abots.

Sturdy sons of the world's strongest, straightest-grained soft and hard woods thrive in this eighty-two-scre forest laboratory in the Sierra Nevada footbilla, Nowhere does sound family stock count more than here, for in hundreds of instances you can see the offsprings of vigorous parents towering above their weaker rela-

tives of the same age.

Ideal forest trees dot the nursery and arboretum. Many of them early give promise of the fine, towering timber they will be two decades bence, when, at what is youth for ordinary trees, they will have achieved full maturity in appearance and size. Already, when compared with normal seedlings they have grown twice as fast as one ordinarily expects a forest tree to grow when left to itself

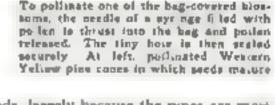
Here one sees the application to trees of modern attentific knowledge of how, by selection and hybridization, superior strains of plants and animals have been developed. "The changes the Institute



Dendrograph attached to a tree trusk automatically records its growth. Here Dr. Ferdinand Hausis, of Carnegie Costal Laboratory, reads the tree record

expects to bring about in pine trees, for example," Austin explained, "are just an attainable as the changes that have been brought about in the development of our highly improved varieties of fruit trees, grains, and vegetables from the original, wild plants. Timber trees are subject to the fundamental laws of heredity as is every other living thing."

These men today concentrate on the pines, among the softwoods, and on timber walnuts, among the hard-



Before pollen begins to fly, men go into the forest and the bags

around the flowers to prevent chance fertilisation that would opter-

woods, largely because the panes are most widely distributed and most generally useful, and the many species offer unusua, opportunities to combine the best that nature, unuded, has produced. Walnut was chosen both because of its range and utility and of the work Luther Burbank and others already had done with it

The Institute was founded in 1925 by James G. Eddy, Seattle, Wash., and was known as the Eddy Tree Breeding Station. During the past few years it has searched the entire Northern Hemisphere to bring together in its arboretum the most complete collection of pines in the world—including more than 100 species and varieties. Botanic gardens (Continued on page 90)

Grasshopper Plane Jumps into the Air



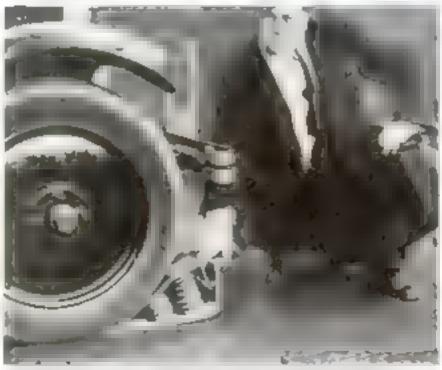


NEW SAFETY RAZOR HAS OSCILLATING BLADE

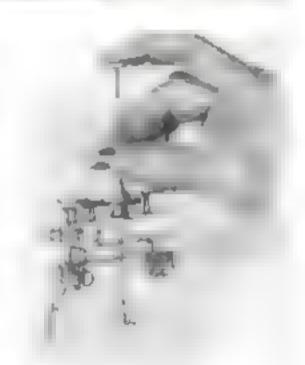
Experience designed for those with tender skirs and only be refer took safe a rate of rator ere plays are as to regards already across the lace, a pair of triction reders test to a cause the whole blade to have so were a record of the whole blade to have so were by arrows a be designed play a lace of the result of the designed play a lace of the pair o



ST CPAG B true-bmorate express train with in the space of 100 feet is one of the feats claimed within the power of a new ape of emergency brake invented by a Russian and demonstrated recent y let ore postar of figure of London England. According to the inven or it may also he applied in au omobles and buses. When the driver presses a hutton, a device sesemblar a drag-shoe drope before wheels Coil springs take up the shock and transform the forward motion into vertical Life



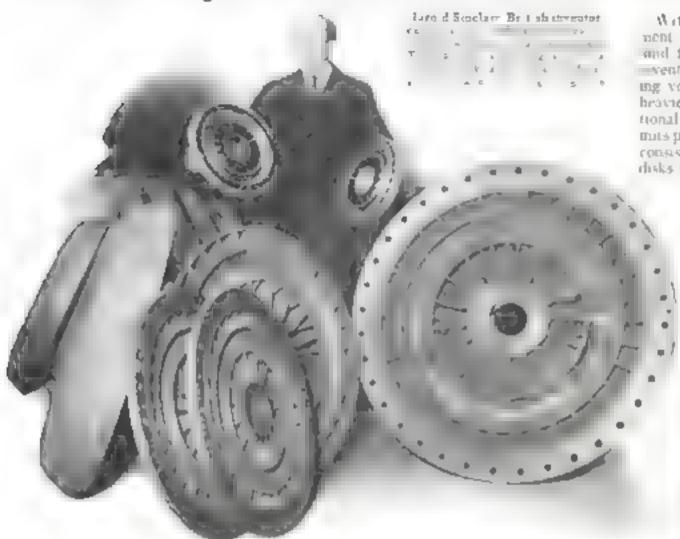
Demonstrating, on a fast bus, the use of emergency brake



TOOL FOR DRAFTSMEN DRAWS MANY CURVES

Ectipses, spirals, and other curves hitherto requiring complicated apparatus to draw correctly may now be inked-in with ease by an ingenious hand tool for draftsmen. The ool which resembles a compass, is held in place with one furger resting on a center pan as shown in the illustration above. When a knurled ring is twirled with the thumb and finger, the pentraces out the desired curve. The type of curve drawn is determined by a prelimipary setting made with a second knob above the pen. A system of gearing causes the pento move toward or away from the center post as it describes an arc about it. Gears are changed for drawing different curves.

Fluid Flywheel Gives Auto Smooth Power



With their adoption as standard equipment by four British motor car makers, and flywheels, a modern achievement of wentive genius, are coming into increasing vogue for automobiles as well as for bravier machinery. Replacing the conventional mechanism, the fluid flywheel transmits power with exceptional smoothness. It consists essentially of a pair of channeled disks free to revolve face to face without

touching, within an oil-filled casing. Oil entrained between the
disks, the only physical connection, causes the rotation of the
one connected to the engine to
turn the other. A car thus equipped glides forward so gently that
a tinger's touch will stop it



Small enough to tilp into an overcoat packet, this chemical hand warme will hold heat for a long t ma

CHEMICAL HAND WARMER FITS OVERCOAT POCKET

First aid for cold bands is a new warmer that ships conveniently into an overcoat pocket. Fireless and devoid of electrical connections, it generates its own heat on the same principle as chemical heating pads of larger size. When a teaspoonful of water is poured into an inner bag containing a chemical mixture, and the bag is replaced in its cloth cover, the warmer emits a gentle heat for a considerable period. Since the chemicals may be used repeatedly, refills are needed only occasionally,



CLOUD-MAKING TOWER MAY SAVE ORCHARDS

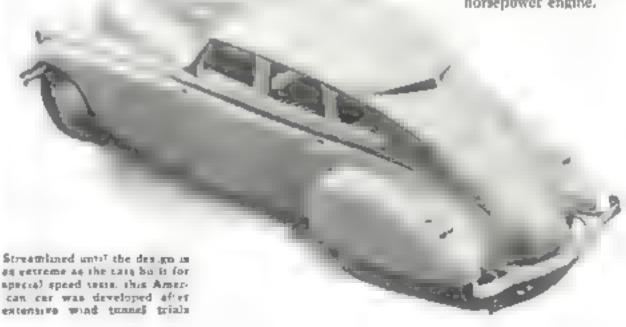
FANTASTIC ideas of capturing electricity from the atmosphere have led to small practical results thus far but a curious tower past erected atop a canyon ridge near Whitter Calai proves that such a dream is hard to down. The Los Angues inventor and bunder of the tower says he will use it in an attempt to release electrical charges from moisture-taden air. Thus he seeks to form a blanket of clouds at will, and archieve thereby a means of protecting orchards against frost.

ODD DESIGN IN NEW STREAMLINED CAR

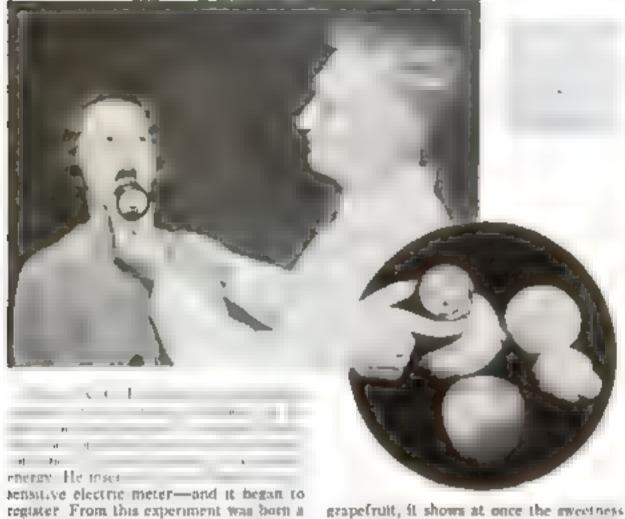
A WELL-KNOWN American manufacturer of fine cars, usually of ultra-conservative style, has startled the motor world by producing a streamlined model that ranks with extreme conceptions of "the car of the

future." Its contour, developed after extensive wind-tunnel tests, gives the new model a maximum speed of 115 miles an hour, while at cruming speeds of sixty to eighty miles an bour it ships mently and

> smoothly through the air The power plant is a twelve-cylinder 175horsepower engine.



Electric Taster Measures Fruit's Acid



grapefruit, it shows at once the exceiness or acidity of the fruit and its ripeness In another test, it proved able to revel a or electrical taster. When its electrones are I condition of the mouth stanged into oranges, lemons applies or

LIGHT RAYS TO FIGHT AIR RAIDERS



new inscrument known as the "electrons"

searchlights to put air raiders out of commistion has just been demonstrated before British Air Ministers office Is by I. to Tape his Ishghish electrical eng neer. His special kemps are said to be designed to bewilder enemy pilots, causing them to lose control and crash. Though the method has not been budy revealed, it is understood that the aghts, when operated in a certain foration. contuer a pilot and virtually tir his inco muscles in knots.

A SECRET system of

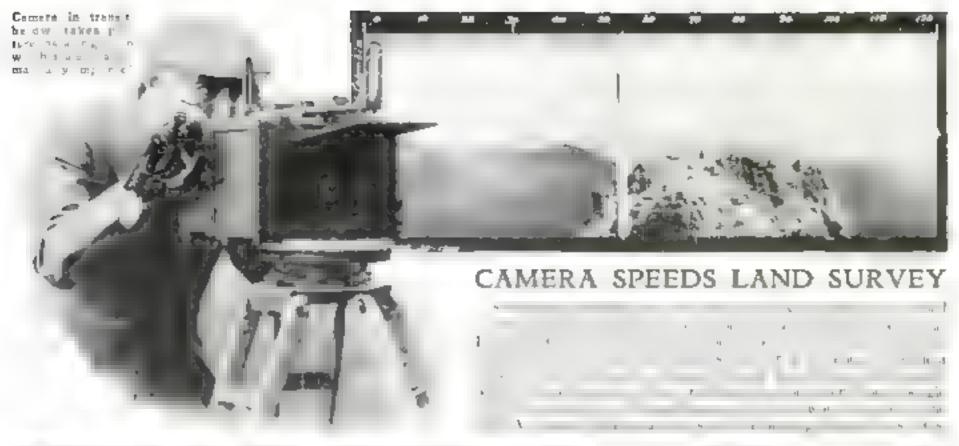
WALKER CAN TUNE IN WITH RADIO IN CANE

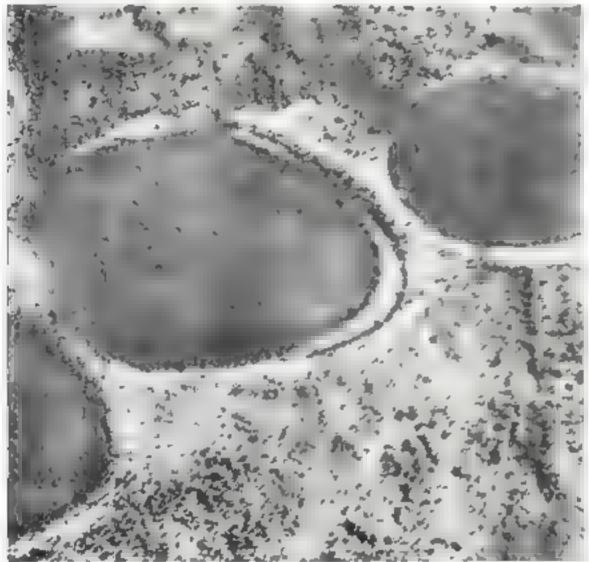
So THAT a pedestrian may enjoy broadcast programs wherever he goes, a German aventor, Alfred Mintan, bas devised what he calls a "radio walking stick," Outwardly it resembles an ordinary cane, but the inerior contains a miniature receiver and batteries. The user has merely to plant the stick in the ground, adjust a pair of pocket. phones to his cars, and listen in, an illusrated in the photograph. It only remains now for the inventor to perfect the apparatus so the pedestrian need not interrupt w ik while listering in a possibility escen by the inventor of the cane

WATER IN PIPE LINE COOLS MOTOR

A NEW departure in auto cooling systems ust introduced in a car of familiar make orings water directly from the radiator to yeta parts of the engine through a pipe the. The water circulates first in special cooling sackets around the exhaust valves hattest spots on the whole motor, then it passes on to cool the intake valves, and the cylinder head and barrels before being returned to the radiator. A water pump bolted. over the pipe line opening provides a circulat on of 1 200 gallons an hour at twenty five-mile speed. This results in an efficiently low temperature, it is said.







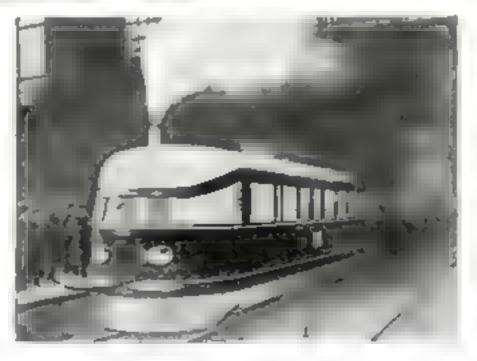


MODEL SHOWS LATEST IDEA OF EARTH'S CORE

WITH the aid of the sectional diagram illustrated above, Professor R. A. Daly, Harvard University geologist, recently gave the Geological Society of America the latest scientific conception of the interior of the earth. The forty-mile-thick crust on which we stand constitutes its real strength, he says. The interior be pictures as a fragile, glassy shell with a tremendously hot, liquid core.

AIR PHOTOS SUGGEST BIG COMET HIT EARTH

Did a giant comet once collide headon with the earth? Prof. F. A. Melton. University of Oklahoma geologist, recently completed a field study of mysterrous ediptical pits averaging half a mile long, found in numbers in North and South Carolina by serial photos like the one reproduced above. His observations suggest they were the result of a colusion with a comet composed of a cluster of meteorites trave. ing six miles a second. The prefustoric bombardment, he says, probably lasting about a minute, must have provided so awesome a spectacle as to make the World War seem like play



TEST TRAIN AT 100-MILE CLIP

SEAFFED just as it was leaving the Berlin station in the striking view at left, bermany a new stream I ned train, the Flying Hamburger," but a speed of nearly 100 miles an hour on its first passenger tun to Hamburg. To minimise wind resistance, even the door knobs are sunk within the body Big Diesel motors, located at front and rear, drive the two-car train, which seats 102 passengers.

Midget Sub to Seek



Simon Lake's Underwater Craft Makes Trip to Bottom of Long Island Sound

cet, crusses upder the power of an electrically driven propeller or it may be towed while sal marger-

Two men one standing beneath each of the contime towers, conserue the crew, two ac ! topaassengers can squeeze tato a forward compartmenprovided with scala. The occupants are in constant corphone communication with the men abourd the Vormono, to whom they can report what they see brough twenty pur hotes at I wondows in the curtowers and led

When the ha ben are named and from an comes to ving in Citooule a hose from the V reminues compressed air Criks. A second hose drawn out used t. Thus the automaterical recuprorate attention buy have

W.J fact Book It is bounded to make a survivor d Frank Cro. w veteren wir

A N Stains Lake Torons 630 marabe anvenor one sked a farmer what crop gave I'm the grevest profit per acre the farmer replied. Heans, I make sixty de lars for every acre i p

Would you be eve. Lake asked him that I know where you can get a return of \$5,000 to \$4,000 an acre? By farming the floor of the ocean, where riches in clams, sponges, and pearl oysters are free for the taking-to s. v nothing of surker treasure

But how are you going to go down and get them?

"In a baby submarine!"

Engineers and officials who witnessed the first public demonstration of his

twenty-two-foot submarine Explorer off City Island, N. Y., the other day and heard Simon Lake reted this story, saw his dream on the point of realization. Purely for buch pea come pursu, y as submarin tarring undersea expagration, and mapping, and the focation of wrecks, he has we signed and built what is probably the strangest undersea craft

First of a fleet to be built and leased to fisheries and salvage firms if it proves practical, the Explorer is a captive submarine Floating on the surface, it resembles a pair of milk cans on a ruft, Air and electric ty reach it through hose and cables from I's mother ship, the auxiliary ketch Normong. At the end of I' 500-foot tether the Explorer, which can descend safely to 300



Drawings show how the new submarine managerers near the surface near the ana s floor and when actually on the bottom. Note floats and auchars has baid at a desired position

> manipulated valves that fill the submarine's ballast tanks with water and send it toward the bottom, continue to breathe as comfortably as if they were out-of doors. The reading of a depth gage and a gentle bump are the only indications that the craft has reached the bottom

> Spectators at the City Island demonstration saw a craft fixted with accessories of a highly unconventional sort. The Explorer rolls along the sea bottom like a submarine runabout, on thirtyinch iron wheels, driven by the same motor that operates the propeller. The wheels may be turned in any direction, the craft advances or moves sideward like a crah with equal case. Two 5,000-watt floodlights illuminate the submarine landscape.

Riches on Sea's Floor



on the bottom of the bull may be opened to the sea, Water will not come in. To test this novel way of collecting specimens, Dr. William Beebe, noted naturalist, recently sat beside the submarme's open hatch and through the trap door, scooped a star-fish from the bottom of Long Island Sound

A diver may step through the trap door and go exploring for treasure, or inspect piers and bridge foundations. Frank Crilly,

pointing propellers just aft of the front wheels, harvest longnecked clams by washing away the bottom maid in which they hurrow. This method avoids breaking their fragile abeas, as would occur in dredging. Special floats and anchors regulate trusing depth, while stern rudders enable it to dive suddenly in pursuit of a school of fish or a harpooned whose—an aid in underwater photography, which will be the Exptorer's first task.

Whirling Vanes Lift and Drive New Plane

Form square vanes on revolving frames serve at wings and propeller for an airplane soon to have its first flying trials. The vanes rotate on payots, presenting a nearly flat surface as they descend. This feathering action, the new York inventor, William Rahn. licheves will enable the craft to bover in the air or to speed forward at a rate of 135 miles an hour. Power is transmitted to the vanes from a 240-horsepower aircooled motor. The fuselage and tail surfaces resemble those of a conventional meplane.

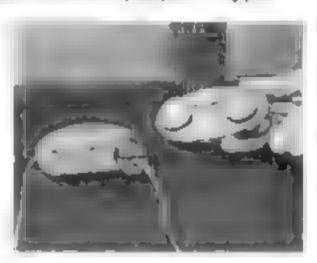




Revolving vanes are designed to serve both as wings and propellur on the airsage plane shown here. In the foreground to a small model to demonstrate the use of the print pie on a big piene

PLUNGER IN HUMIDOR FILLS YOUR PIPE

SMUKERS now are offered a humidor that not only keeps tobacco moist and fresh, but even fills their pipes for them. Raising and lowering a plunger on top of the bowl stirs the contents, deposits a measured charge in n pipe placed beneath an opening, and tamps it down, as shown in the photo at left. Receises for pipes, cigarettes, and matches are provided in the base of the humidor



TWO VACUUM CUPS HOLD NEW OUTLET TO WALL

MASKS TESTED WITH REAL POISON GAS

Textering death daily is the lot of a fliw carrie men in a Laurement Laboraterry where a new waters thanber containing an appreciable quantity of real poison gas is reported in use to test the air-pandying canisters of military gas masas Masked expensioners sit outside the deadly chamber, and breathe through hoses that terminate in the canisters within. A whitecoated physician stands near to render first aid, in case the poison-absurbing chemicals should fail to function. Only in this way can new types of equipment be tested.

> Photograph in circle shows Eng. 45. supe menters wearing gas makes and breath ner on ane from campators not in a seased



he has designed, a Japanese inventor is ht. . . able model if ustrated at the right to fly under power. It will be powered with a four-cylinder a motor, and the inventor R. Okahara, proposes to steer and land it by rathe control. A stabiliser similar to one planned for the full-sized craft, will ad ust the wings automatically to compensate for sudden gusts of wind

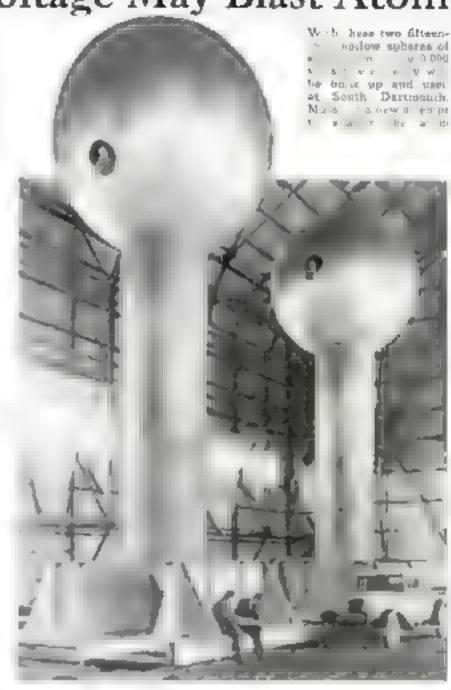


GLOBE STORES LIGHT FROM ELECTRIC BULB

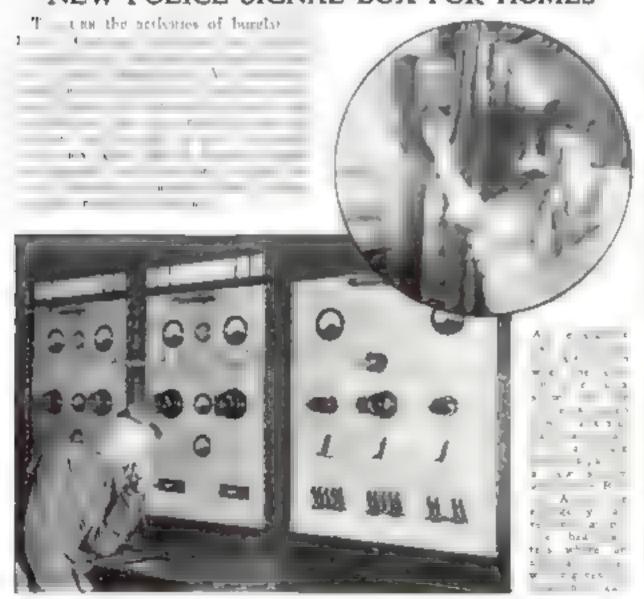
STORING light in a globe was a feat recently demonstrated by Ethan I, Dodds. America a most pro-inc inventor, whose collection of more than 2,000 patents was exceeded only by those of the late Thomas A. Edison. The evacuated interior of Dodds' magic globe, which is covered by welve of his U. S. patents, is coated with n mixture of phosphorescent chemicals. When an electric bulb is held in an aperture and flashed on momentarily, the lamp glows with a soft, even light for two hours The bottled light, Dodds says, is suitable for use in mones and in industrial bundings where a night watchman making his rounds, could recharge each globe with a 6 k of his flash igh.

Giant Voltage May Blast Atom

MAN-MADE lightni dech goos thw genn a blimp hangar at South Dartmouth Mass where a fantastic machine to harness the power of 10 000 000 volts is nearing conspletson. 5itting inside one of its two ballow spheres of aluminum, nearly afteen feet in diameter, an operator will apply the huge voltage to a vacuum tube Though his body will be charged to the same voltage as the spheres, he will be as sale as though be stood it mile away Scientists at Massachasetts Institute of Technology will use the big generator in an attempt to blast atoms to pieces. The striking photograph reproduced here gaves an impression of the machine sproportsons. Whirang endless belts of sick time up charges of electricity on the spheres by a new princsple, which the inventor demons rated a year ago



NEW POLICE SIGNAL BOX FOR HOMES



SHIP'S PASSENGERS ARE LANDED WITH DERRICK

Scenes like that in the photograph below, suggesting a thrilling sea rescue, take place when visitors land on the jagged coast of Hamakua, Hawati, There small boats bring passengers within range of a detrick-like landing gear that has been erected on a cliff One by one, the passengers are hoisted ashore



Derrack-like landing gear used at Hamakua. Hawasa (a sweet ship's passengers ashure

Where Telescopes Look Like Big Cannon



COVERING FOR ELECTRIC CORD ENDS KINKING

TROUBLESOME kinks in cords for the telephone, the electric fron, and other household fixtures are prevented by a new clastic covering. Simple to attack, it is merely wound around the cord as shown in the photograph, without need of disconnecting any of the wires. The cord affectivity is not impaired, but there is no longer any tendency to snark. Since the cavering contains no metal, it cannot cause a short circuit. It is also adopted for use or chetric light, ong ex ension wires.



This elastic covering is wrapped around telephone cords to keep them free of kinks



PAINTER'S SLIDE RULE HELPS MATCH COLORS

A context slide rule, to aid in matching my tint, has been devised by a large paint manufacturer. One of the cardboard devices is supplied for each color. When the painter has to match a brown auto enamel for example, he selects the brown card and pails down the slide attempting to match the color on the auto as seen through an aperture in the card. Since two areas are compared side by side, a match is easy

DETACHABLE CAR TRUNK FITS OVER SPARE TIRE

Firring over the space tire, a new detachable trunk for automobiles is held in place by a single wing out and boil. Unly a few seconds are required to attach or remove it. The tire serves as a shock absorber for the con ents. Especially useful for picnics, the trunk may be packed with food and removed later to the scene of the meal without unpacking if



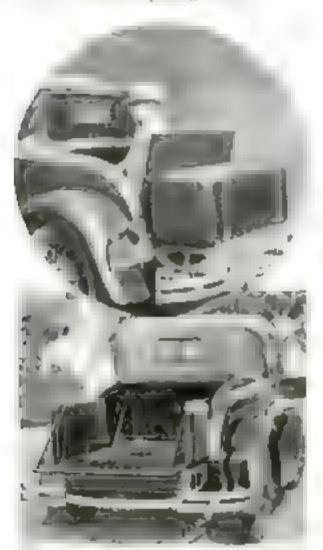
POPULAR SCIENCE MONTHLY

Toys Used by Scientist in Study of Vibration

Recent attid at of self-induced v.bration will peak a onguneers to make hig dynamic atmatures, the the one above fun more smoothly

NEW PLEASURE CAR IS ALSO A LIGHT TRUCK

Care as a pleasure and a business car in one in the achievement of Peter Linn Los Angeles, Cauf., inventor, The rear end of the car is provided with a slicking deck, collapsible rumble seam and a looking trunk. To transform the car into a light delivery truck, deck and seats are pushed out of the way and the trunk unfolds to form a package carrier



The pleasure car for private use, shown in the circle is eastly converted into this light truck

MODEL OF HUMAN HEAD AIDS RADIUM RESEARCH

A Live-size wax model of a human head is being used by a British hospital a test radium rays, have the wax has about the same density as human tissue, the effect of radium upon any internal part may be measured by userting a pite agraphic form in the proper.

tific study of self-induced vibration, the phenomenon that causes wing flutter in airplanes and shimmy in auto wheels. To find its underlying laws, J. G. Baker, research engineer of the Westinghouse Electric and Manufacturing Company investigated hundreds of examples of self-induced vibration. One was a toy walking man, that oscillates with a sideward motion when pushed forward, another, a toy boat propelled by water pulsing in and out of the built, under the motive force of heat

CHILDREN'S toys aided a recent scien-

from an alcohol lamp. From his research. Baker concludes that the phenomenon can be prevented

Only a toy to children by the negro shader busped I G Bahry Westinghouse one neer pry and the secrets of v b a on, a study which be constituted with the top bust right and with bundress of other things. As a result of his work big much nery may be freer of vibration.

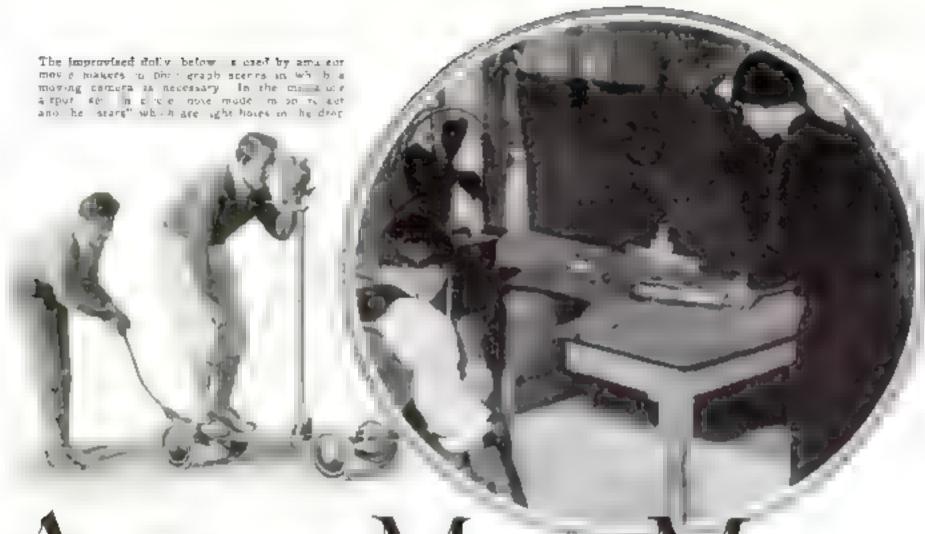
WALKING IN TREADMILL DRAWS WATER

A pritish country dweller walks a quarter of a mile to get a drink of water, without leaving his own rellar. To take the large backet in his soo tand well bred Hoare of Beauworth Hanks, installed a twelve host treasurall beside the shaft

When he steps inside it to take his daily constitutional, a wind, as the last exercise to practical use and whose a the cable to which the bucket, shown in the photograph below, is attached. Thus he secures his daily supply of water



Fred House of Beauworth, England, is drawing his daily supply of drasking water. He does this by taking his exercise and de the twelve-lost treadmill which winds up a cable from the well



Amateur Movie Makers Use Professional Tricks

N LITTLE HOLLY WOOD, the amateur cinematographers are shooting.
Home-made floodlights biase. Embeyo Garbos appear. Miniature cameras click, as amateur directors wield tographone and script to produce thrilling religion drams.

In the heart of Los Angeles's cinema capital, unknown to the general public is the Hollywood of the amateur movie-makers, whose activities, carried on in attics, garages, and parlors of private homes, are quite as interue and as interessing as the production of mission-dollar films on the glant movie lots nearby

Recently I visited a number of the leading amateum in their improvised studios. I was shown cornedies with trick shots in which dogs walked backward magicians poured water from bals, and gorilas jumped twenty feet into trees, mystery pictures with thrilling laboratory scenes, shot in the offices of a friendly doctor; stories of big-game hunting in Africa, made at a nearby soo, with trick effects added through the use of homemade props, and news reels of actual events, filmed from half-a-hundred striking points of vantage not covered by professional cameramen

In this busy rolony of amateurs, clerks on a monthly pittance rub eibows with financial leaders. Bookkeepers and bankers work side by side, exchanging ideas, and vying with one another in producing new photographic effects. Professionals are barred, All are as jealous of their amateur standing as any college football star; yet

the results they achieve, using homemade equipment improvised from whatever is at hand, rival the work of Hollywood professionals with their elaborate equipment.

Seeking new thrills for readers of Poputan Science Monthly I was taken behind scenes to witness the filming of "The Lunar Expedition" by two Los Angeles amateurs, Harry Babb and Harold Knoblock. When I visited them in their studio, located in a garage in the rear of the lot, they had already been working on the picture, evenings and spare time, for seven months and stall had much left to do.

The methods they were using were identical with some of the eleverest professional effects I have seen in the big

studios nearby, and ranged from indoor settings, built accurately to scale, to miniature model sets, re-projection and other difficult frats of the movies.

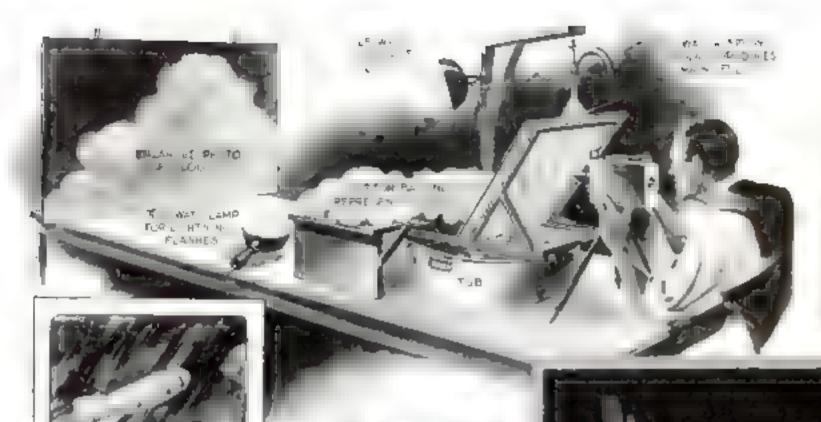
"Our first shot."
young Knoblock
told me, "is a night
scene showing two
explorers at an airport, ready to take
off for the moon in
a rocket Naturally
real moon-rockets
are scarce, so we
built a miniature
airport set, to scale.
The rocket we made

of metal, piercing the walls with a row of portholes and illuminating it from inside with a tubular showcase bulb.

The main building at the alroot was a hand-painted cut-out, with a black sky background suspended from pulleys overhead. Light from behind the scenes streamed through the windows and doors of the cut-out, and illuminated the tiny stars in the midnight sky. Two toy figures of policemen stood at the entrance to the building. The airport beacon was a dashight bulb, flashed by hand. A fan at the side of the set stirred up a breeze that spun the propeller of a toy airplane on the landing field, and tossed the ornamental bushes planted in front of the airdrome



In its trip to the moon, the rocket passes through this storm. Light flashing through jagged cut produces the effect of lightning



What sharp and the

as a Page the st

HOW THE POCKET PLEW THROUGH STORM

This drawing shows his view of a storm seems in the or a storm seems in the or a to the moon was about Water falling down he glass is some of he access he among a mand or of bout a many through a mand or of bout a samp through was the glands on the same same a same a

HILW Thrillers, Made in Attic or Garage, with Tiny Sets, Rival the Work Turned Out in Big Studios with Costly Equipment

At this point in the same a more was transferred to the interior of the rocke has these scenes we can two carefus to ets, each six feet high and five feet with test we fix ed with con role made the racto dials and lighting fix as a light of grass panels represented television equipment.

FHRME OF HE AS RECORDED BY A PA

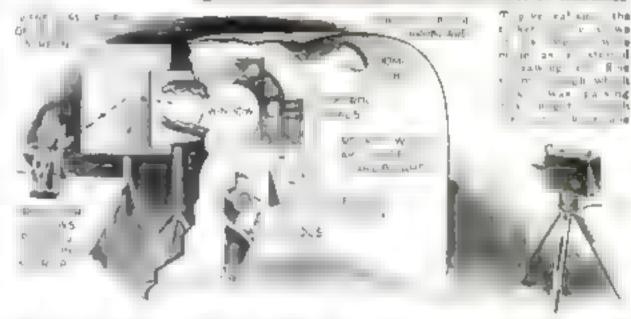
"As the rocket rose, the actors, looking out, saw the airport recede and the stars come into view. This effect we achieved by lowering the background, allowing the buildings to pass out of camera view, and the stars to move downward, producing he it is on that the rocket was rapid yrising on all way to the moon

"To get the effect of vision through a window, a the note of the rocket. We had to borrow the professional trick of reprojection. Eighteen inches back of the window, making it appear that the rocket had thick walls, we placed a celluloid



Making titles. These are hand-lettered on cards and photographed with a movie camera

By Sterling Gleason



screen. At an angle we set a large intrrot, reflecting to the surface of the screen the images thrown up by a projector, through which we run films showing various scenic effects previously shot

"One was a view of the moon, rapidly enlarging as the rocket rushed toward it Another was a close-up of the mountains of the moon. More difficult to make was a scene in which the rocket passed through a terrific storm in the upper atmosphere

For this shot, we painted clouds upon a cardboard background, slit with a forked pottern. Flashing a light behind the scene produced a long, jagged tongue of lightning. On the floor of the set, we piled wads of cutton until the tops of the wisps

showed in the camera as clouds benea he the rocket. For rain, we directed a fine spray of water toward the camera, which was protected by a pane of glass about eighteen inches in front of the lens. Thus we produced the effect of rain beating against the window of the rocket

"The film projected upon the celluloid window of the rocket set, made a teding accompaniment to the action of the story Television effects were also produced by re-projection. When the hero pressed a switch to communicate with the earth, an image of the speaker at the other end flashed up on the television panel—coming, in reality, from the hidden projector behind scenes." (Continued on page 101)

Shattered Men Rebuilt



SHAPING SOME FOR HUMAN REPAIR JOB With this high spred motor is piece of this bone is bring abased as a screw see it can be employed to inputs a broken base

A DISTINGUISHED looking man stopped me on the street Remember me, Doctor?" he asked.

I looked at him closely. On each cheek there was visible the short line of a scar Eventually he identified himself as a soluter I had treated in 1918 after he had undergone what was probably the most amazing burnan repair job I have seen performed.

His whole lower jaw bad been shot away in the Argonne, Surgery had given him a new jawhone and had surrounded his comparatively uninjured tongue with an artificial mouth scuiptured from transplanted, hving flesh! Today, his only vishie disfigurement is that inch or two of scar on either check?

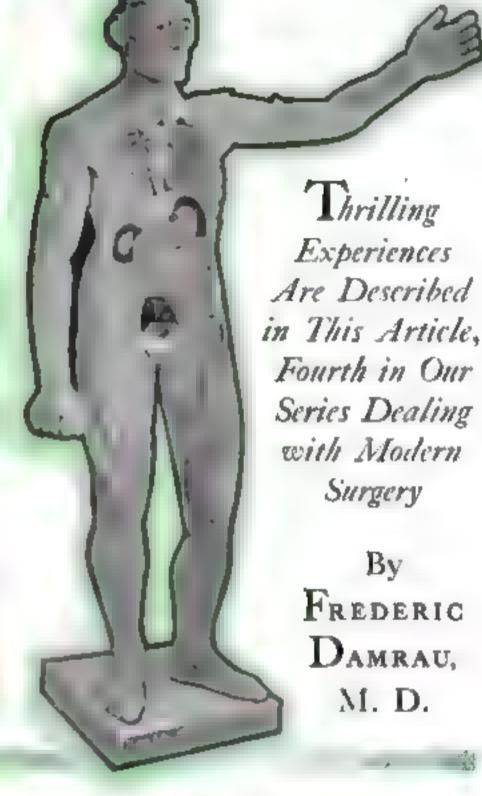
How was this miracle performed?

First, the surgeon modeled an artificial jumbone from vulcanite the hard-rubber compound used by dentists in making plates. Thus framework he acrewed to the samps of the jawbone. The next step was to construct a floor for the artificial mouth. The material used had to be mutous membrane like that on the inside of your cheek. The task seemed impossible until the surgeon hit upon the idea of using the cheek itself.

On the inside of each threek, he cut a triangular flap. Then he turned down the two flaps and sewed them together. The result was a serviceable lining for the new most?

The last stage of the operation was the most sensational of all. The surgeon used

This figure of the human body, used a the case moons of medica achoole gives a suggestion of the emeragy interests human machine and indicates the detection of the operations, described to performed in order to prove successful



the patient's own scalp as material for molding the chip and covering the artificial jawhone and the gap left in the cheeks. Across the top of the brad, from ear to ear, be cut a strip of scalp, leaving it permanently attached just above each ear. This strip he slipped down in front of the face and over the artificial jaw and cheeks until it assumed the position of a wide chin-strap

Then he molded it into place, statching the scalp flap to the bealthy skin of the cheeks and neck. Hair roots, carned in this transplanted material, produced a thick beard which later hid most of the scats left by the operation

To fill the scalp wounds, skin grafts were taken from the patient's thigh, using two sharp safety-razor blades, By a lucky chance, his legs were coated with an unusually heavy growth of hair which, when transplanted to the scalp, played an important part in concealing the scars on

the head. Thus, one topsy-turvy result of this amazing piece of surgery is the fact that the patient's heard came from the top of his head and hair now covering his scalp originally grew on his leg

Such achievements of the operating room read like fairy tales; yet, they are matters of record. In the surgical reports of almost any large city, you will find similar wonder stories of human carpentry Splicing living nerves as an electrician splices wires; dovetailing bones as a carpenter dovetails wood, sewing muscles in place as a seamstress sews cloth, the modern surgeon adjusts and repairs the human body by applying the techniques of many trades, he helps the deformed, the distinguish, and the handicapped.

A remarkable instance comes from the Middle West, Here, a boy born without arms, can now through a miracle of surgery dress himself and even operate of

typewriter*

by Master Surgeons



Doctors who examined him at the time of his birth, could not find even the smallest stump of an arm. The case seemed hopeless. Then, when the boy was twelve years old, an x-ray showed that each armless shoulder concerled a small undeveoped piece of arm bone, three inches long on the right side and four inches long on

Basing his plan upon this discovery. Dr. Harry E. Muck, a Chicago, Ill. surgeon decided upon a daring experiment. Rewould free the two rudimentary arm bones hidden under the aboutders and sew powerful chest muscles to them in the hope that Nature would develop them into useful stumps.

Beginning on the right side, be made two four-inch incisions below the shoulder and reached the hidden bone. It was shelveled and no thicker than the wrist bone of a two-year-old child. Carefully cutting it free, Dr. Mock pulled it outward to an



goon trees, one end of powerful chest

muscles. Next, he laced them to the outer

layer of the bone, using strong braided

silk, Finally, he covered the stump with

grafted skin and let it heal Two weeks later, the rudimentary bone under the left shoulder was released by a similar operation. The boy now had two stumps for arms. But he was unable to move them in all directions. A physiotherapist, expert in muscular troubles, was called in. He worked out special exercises

to train the chest muscles.

Day by day, the power and flexibility of the stumps increased. By the tame the boy had gained full control of them, he was ready to be fitted with artificial arms. He soon learned to use these so expertly that he can take care of himself and even write letters on an ordinary typewriter.

Another unusual operation saved the arms of a sixteen-year-old girl at Omaha, Neb., only a few weeks ago. When her left arm and hand began to shrivel mysteriousis. X-ray pictures were made of her chest and shoulders. They revealed two extra ribs pressing down on nerves which

e roded the left arm. The scientiacan b were removed by a surgeon and de trou de disappearer

In the operation room, surgeous must be constantly on the alert for also made Lauran he are not the automoranes. The surgeon car lot not upon the parts always being in the same place. In England, for example there is a club with half a dozen men iem off having their hearts on the right of le. At Poptarblan, Mo., not lung ago, a sevenyear-old girl, in perfect health, was found to have ber heart and liver on the wrong side and her stomach put in backwards!

I have known patients with only one kidney and with the spleen on the right side of the body instead of the left. Young surgeons are always warned to watch for signs of appendicitis on the left as well as the right side of the abdomen. A number of cases are on record of people whose appendices were thus transposed. Again, a certain percentage of patients have anomalous arteries that follow other than normal paths. In cutting into the body, the surgeon always proceeds cautrously to avoid slatting open such a blood channel found in an unexpected place.

Repair work on arteries is one of the most ticklish tasks a surgeon has to face. Yet, in Paris, not long ago, the French surgeons, M Payer and M. Lambret, actually joined two arteries together, as a plumber might join pipes, to form one continuous channel for the bloods ream,

Their feat was part of an operation which ranks among the most spectacular



Mars in the tool chant of the modern bone surgeon. Note the great number and variety of narraments, among them has saws tape and desp. dit to practigally everything that would be found in the two chest at a good mechanic

in all medical history. A fifteen-year-old boy had lost his right thumb by catching it in the gearing of a machine. Ordinarily, he would have been bandscapped for life, But, by a piece of surgical wisardry, the Paris doctors repaired his hand, making a new thumb out of his bag too'

This remarkable operation was carried out over a period of two weeks. The ligaments had to be connected and allowed to grow logs, her. The vesus and arteries of the big toe had to be newed together with those of the palm. Nerves had to be sphred. And, finally, the tendons of the big toe had to be hooked up with those of the forearm so the thumb could be

moved as desired.

During all this time, while the big toe was growing onto the hand, while it still remained attached to the foot, the band and foot were bound together to prevent any movement that might disturb the delicate tissues knotting together. The poatton was uncomfortable, but the result justified the pain. For the grafted toe enabled the boy to hold a pencil and write egibly and inter tests indicated that in muscular power and sense of touch, the remarkable toe-thumb was entirely normal

A British surgeon, Lieut.-Col. Sir Robert Jones, describes another operation in which a lost thumb was replaced by a finger removed from the good hand. In due time, it grew in and could be used in much the same way as the original thumb.

The reverse of these operations, it case in which a man lost all four fingers in an accident but retained his thumb, resulted in an equally dramatic piece of work by the famous New York surgeon, Dr. Fred A bee. As the thumb was useless without a hinger against which to work. Dr. Albee created a finger out of a pencil of bone wrapped around with living flesh and punted on the hand.

The bone was cut from the putient's own shan-bone so it would be of the right type to knit with that of his hand. Rapidly, it was shaped on a miniature lathe given a screw thread at one end, and then screwed into an opening drilled in the bone at the base of the missing forefinger A flap of flesh, from the patient's abdomen, which had already been stitched to

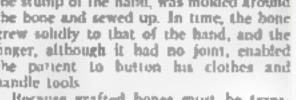
the stump of the hand, was molded around the bone and sewed up. In time, the bone grew solidly to that of the hand, and the finger, although it had no joint, enabled the parient to button his clothes and handle took

Because grafted bones must be transferred quickly and quist be of the same type as the rest of the patient's bones, they are usually taken from his ship. For this trason, bone surgeons often refer to the shin as the human lumberyard. In a few months after a pacce has been re-

moved, new bone forms and fills in the gap

A year or so ago. saw a man with a glass eye and a surprisingly natural eyelid made from the skin of his forebead. In a hunting accident he had been shot

To insure a piece of bone to hold two broken patts togeth or the supars b t seshaped as a actual and it is then severe. ed into he es dra led in broben parts





through the eye. Although the eye was destroyed the bullet luckily took a slantang course and missed the bram. But it tore the eyelid to pieces, giving him a gruesome appearance, A New York surgeon created the new cyclid by cutting a thap in the forehead, trimming it to the proper shape and turning it down over the eye cavity. A skin graft filled in the place from which the flap was cut and the remarkably successful repair job was complete.

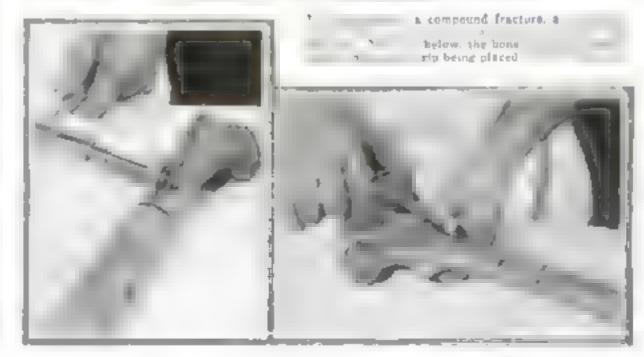
In curing cross-eyes, they ocular muscles are surgically tucked or advanced to remedy the defect. The trouble is caused by the muscle attached to one side of the cycball being shorter than the one on the other side. The eye is turned to the side of the shorter muscle. To equalize the pull of the muscles, the surgeon either sews a tuck in the longer muscle to shorten it or be cuts it loose from the ball of the eye and advances it to a new position farther forward, where it is sewed in place

with surgical pilk

By shifting the position of a tendon from the back of the leg to the front, the surgeon can sometimes aid those who have been attacked by infantile paralysis. I know a young dentist who had infantile paralysis in 1916. As a result, his right foot dragged when he attempted to walk for years, he were braces to hold up the tte of his aboe. Then a simple operation was performed. The tendon of one of the large muscies of the back of the legwhich was not paralyzed, was switched around to the front of the leg and fastened with kangaroo tendons to the tough membrane beside the anklebone. Here it took

> the place of the paralyzed muscles along the shin bone, allowing him to raise the previously useiess foot at will In cases of slight paralysis, doctors nometimes employ a steel apring attached to the beel and sole of the show to prevent the toe from dropping, But, by the surgecal tendon-shifting described above, a permanent cure is often effected

> Another dramatic phase of the human carpentry which goes on in the operating room is the (Continued on page V)



Making Our MONEY



Last Longer

Warn out U 5. bills after they have been reduced to birm on a chopping machine are shove td into a furnace and burned En per means ere study to find a process of making were ing paper out of these but t and to end thto big waste



Constant Tests by Our Government Seek More Durable Paper Currency

OW I wish I could make We we all expressed the We ve all expressed that anaverial desire

The United States Government is wishing the same thing—that it could make its money last longer. Even now, it does a lot better than most of us for it makes a dollar bill last time months! But the Treasury Department un't satisfied with the average life of our paper money, so scientists in the Bureau of Standards Washington, cooperate with the money makers of the Bureau of Engraving and Printing in a never-ending search for a more durable paper on which to print the government's promises to pay Also they are in

search of a more nearly impervious coat ing with which to protect them against the me caple use and abuse to which they are subjected

No earlier paper money ever met the gruelling wear that the small-size dollar buls, forming about sixty per cent of our paper currency, must endure. Modern life.



As they are printed on both sides, bills must be opique and this instrument tests paper a ability to prevent the passage of any confusing light

has increased the activity of the dollar The automobile is guilty of shortening the tife of many a bill. Out of every three persons living in the United States, one drives a car Naturally, millions of our bills pass through the hands of persons whose hands are covered with oil and grease, damaging to the toughest paper With this accerching muchine, a sample of paper indicated by the acrow at tested to de erming (th tennels strongth. A record is made of the futee necessary to break at

ARTHUR GRAHAME

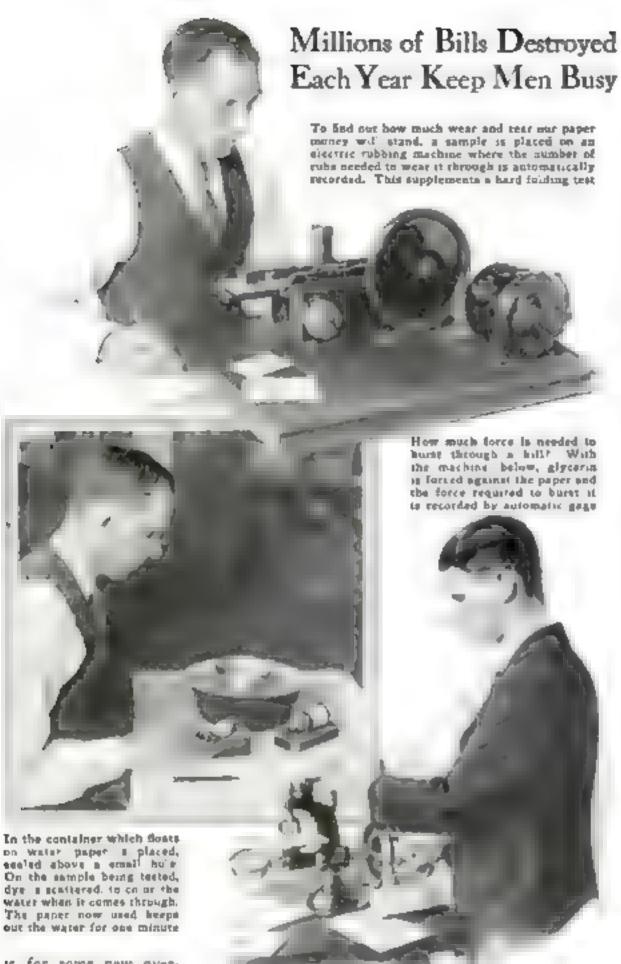
currency that can be manufactured A bill leads a hard afe! Folded in wallets, curled in rolls, caretessly crumpled in pockets, stained by of or eaten by acid of en wet the wonder is not that it lasts only nane months, but that it remains serviceable for that length of time before it must be returned to the Treasury Department and destroyed. But our federal currency makers hope for the perfection of new processes that will make I possible for the n to turn our bills even more durable than those

'Our present paper money is satisfactory Alvin W. H. director of the Burray of Figraving and Pinns ing told me at, we always are trying for something even more satis-

factors

116 W 111 115C

Much already has been done. Several vears ago papermaking experiments conducted by the Bureau of Standards resulted, without additional cost to the govemment in a forty per cent increase in the lac of paper propey. Now the search



is for some new overconting for the bills that will be even more ef-

fective than the animal glue sizing now used. Bureau of Standards experts, led by B. W. Scribber, are experimenting with various other paper sizings, such as casein, lacquers, cellulose and waxes

The paper on which our currency is printed is made from purp obtained by cooking lines and cotton rags, waste products of the garment-making trades, in a solution of either lime or caustic soda. Almost all of the lines rag used in paper making is imported, while all the cotton rag is of domestic origin. The mixture now used is seventy-five per cent lines and twenty-five per cent cotton.

Experiments are now being made in the testing laboratories to determine the maximum proportion of cotton that can be used in paper-money manufacture without decreasing the strength and durability of our bills. Bureau of Standards specialists believe it is possible to increase the cotton fiber content without sacrificing quality or strength. Already paper of excellent quality has been made from a fifty-fifty mexture of lines and cotton

While a change from rag paper to wood fiber paper for bills is unlikely, such a change might be necessary in some national emergency, and experiments are being made with the better grades of wood fiber papers to determine their value as paper money. New recipes and formulas are constantly used in the making of experimental currency paper in the Bureau of Standards' paper making mill. These products are turned over to the government's printing experts who determine their autability for paper money.

Several interesting tests are used by the Bureau of Standards to determine the fitness of these various papers.

The ability of paper to resist moisture

is determined by finding with a split secand stop watch, the time required for water to soak through the sample. Small pieces of paper are mounted in aluminum floats which are launched in shallow containers of water. There is a hole in the bottom of each float, over which the specimen to be tested is clamped. A mixture of sugar and chemical dye is sprinkled on the upper side of the paper, and covered with a small glass. When the water scales through the paper and comes in contact with the dye, a blush-purple discoloration results. Currency papers resist the passage of moisture for at least one minute.

The tensile strength of currency papers is found by stretching them on the opening jaws of an instrument that has a pendulum to record the force necessary to

break the paper

To determine the bursting strength of paper, a sample is held, under tension, against the rubber diaphragm of an instrument that has a hand wheel to pump glycerin against the diaphragm. A recording gage registers the rupture pressure.

An indication of how paper currency will stand up under the wear and tear of daily use is provided by testing paper samples in an electric rubbing machine that continuously rules the paper back-and-forth until its surface is worn through. A counting attachment keeps tabs on the number of rubs the paper will stand

Another electrical testing machine makes it possible to determine the folding strength of paper money. The sample, under tension, is pressed over rollers again and again until it fails, every folding of the paper being registered. When tested at standard humidity, our present paper money will withstand 5,000 such foldings before it breaks.

The importance of making our money last as long as possible is shown by the fact that between \$.000,000 and \$.000,000 pounds of currency wears out each year, and must be replaced by new bills. Last year over 900,000,000 used-up bills were destroyed by the Treasury Department

The process of replacing old paper currency is continuous. Each business day, the twelve Federal Reserve Banks in varous sections of the United States remove from circulation the worn-out bills that come to them, and replace them with crisp, fresh notes.

The old bills are atsched face upward, and cut in half. To discourage attempts at robbery in transit, one stack of halves is shipped to Washington that day, and the remaining stack of halves is shipped the next day. At the Treasury Department, the halves are checked against each other, placed in scaled trunks, and sent to a machine that chops them into small

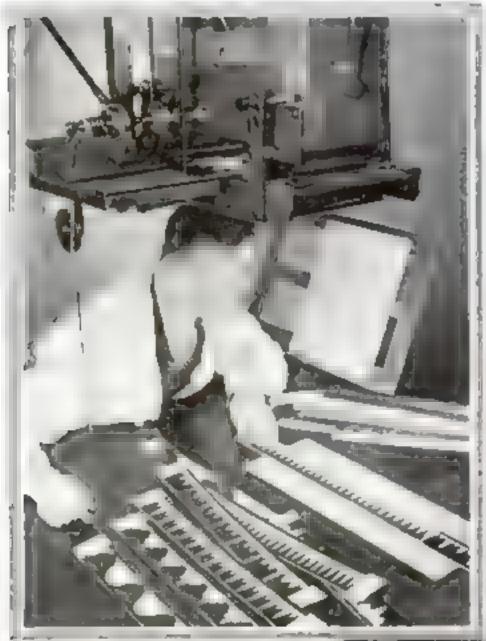
These bits are shoveled into tanks containing a solution of caustic soda. From the tanks, bills, note representing a tremendous fortune, emerge in the form of a gray, mucky pulp, most of which eventually is burned, although now and then a customer is found for a few carloads of it. An experimental salvage plant is being built at the Bureau of Engraving and Printing, and it is hoped that it soon will be possible to clean the pulp and make writing paper of it.

Ever since 1862 the government has used distinctive (Continued on page 94)

Gold Mining taught with Models

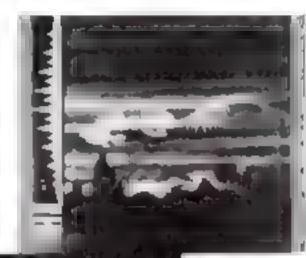


Odd Designs on Film Turn to Music

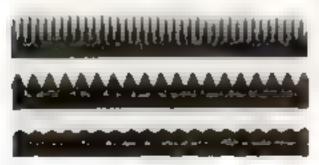


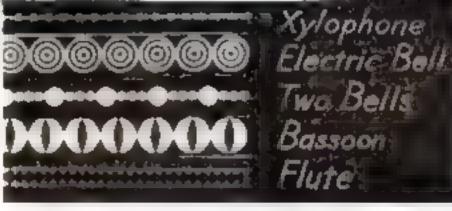
NTHETIC music is being produced in a German film studio by reversing a familiar process. When artists sing and orchestras play before the talkie microphone, their music is recorded, in one standard method, as a wavy black line upon the sound track of the fism. What would happen if an artist were to draw arbitrary shapes, imprint them on sound film, and run it through a reproducer? A German technician, Oscar Fischinger, recently tried the experiment with starting results. A series of concentric care est drawn in a strip and photographed upon sound film, immated an electric bell. Eye-like spots reproduced a bassoon, and a pattern of dots sounded like a Tylophone, Varying the sure and shape of the singing ornaments produced tones that varied correspondingly in loudness, puch and timbre and they could be recorded consecutively to form a synthetic tune. Even the human voice could be municked. Fascinating possibilities await perfection of the method, which American experts compare at present to "the first crude stages of television." Will the composer of other days, scated at his plano and jotting notes upon a staff, give way to the draftsman at his table? Equipped with drafting tools and photographic apparatus, a composer could record his masterpieces eliminating the possibility of misiaterpretation by an inexpert performer.

The odd geometrical designs, such at the less drawn on ong ett pa a a being photograph. ed upon sound the film is run through a repreducer the I nes will make music d ffering secording to the shape of the pattern. At (tight an animated G041153 besting hend made music



The same note, in the designs below it draws, top to buttom, to sound loud, soft medium





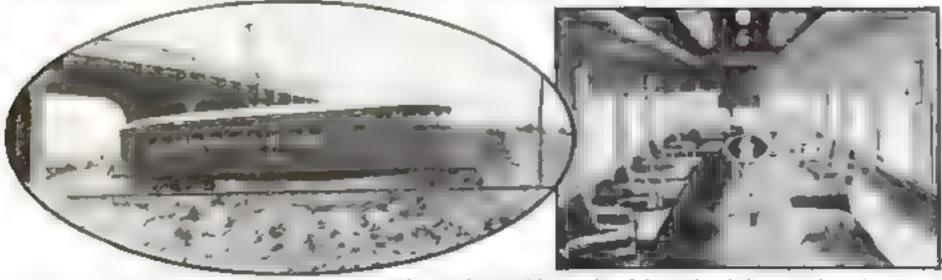
When the eculoue ornements at
all ware photog aghed spacific
sound film and
tun through a
tenroducer they
readized a mu
ac as through
from the net uments indicated

Final Tests Now Being Made of America's Fastest Railway Car

Snow to be seen in many states is the eigh v-five-or re-an-hour streaml ned take way car of a uni num that recently had its first demonstration at Detroit, Mich. (P.

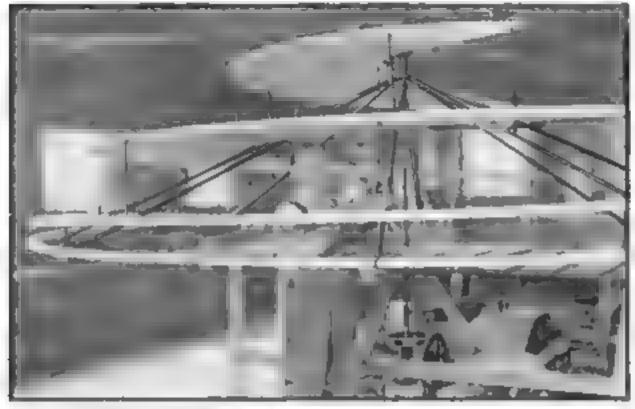
5 M Feb. 33 p. 21) It has just begun a series of trial runs that will take it over tracks of the Michigan Central and New York Central lines. The sixty-foot car

accommodates forty-two passengers in its beat insulated and nic-conditioned interior. It is powered with a sixteen cyander gasoline engine.



Here is the new attenuitined railway car during one of its trial runs and at its right is a view of the interior which accommodates 42 passengers

Corkscrew Plane for Vertical Flight



J P Sellmer of California, is shown with his working mode? of a confected place that he expects to use vertically Practical tests of the stronge machine will be made soon

CAN an airplane he built that will fly straight u. Many odd craf's have been built in vain a terroits to solve this problem but J. P. St. mer of Stinson Beach, Canf. is puring his hones to one of even a ranger design. h. n. most. H. s. corkscrew airplane. according to turn will aft. itself.

by means of a whiching, continuous wing of spiral design. A small propeller will keep the framework from spirning. Though attaining experts offer the idea by le cut-baragement. Selliner is busily put ing the limiting touches to a large model with which he will test his theory.

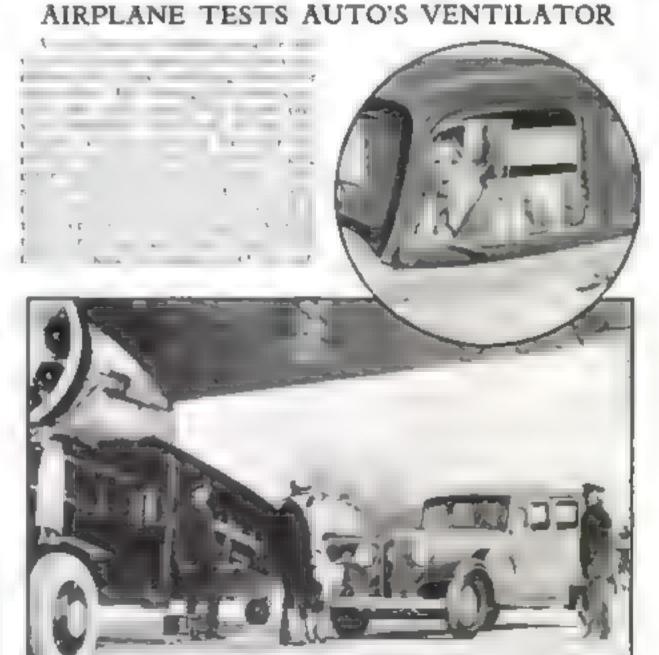


TELESCOPE EYEGLASSES MAKE THE BLIND SEE

TELESCOPE eyeglasses, just perfected by a New York optometrist, will enable forty percent of persons incapacitated by bland-ness to return to norma, work, the American Academy of Optometry was told recently. The powerful lenses enable a partient with oney two per cent of normal vision ordinarily caused as total bland-ness, o see clearly Because of their high power the glasses distant a spects alights.

NEW MACHINE GAGES MAN-MADE QUAKES

To struy the transmission of earthquake waves through the earth's crist German meteorologists are setting off artific at explosions. An apparatus colled an "undograph," illustrated above, is used to netect the tremor. In one test a ton of high explosive was fired on an Arctic island and over three bours later the shock was detected at Potsdam, Germany



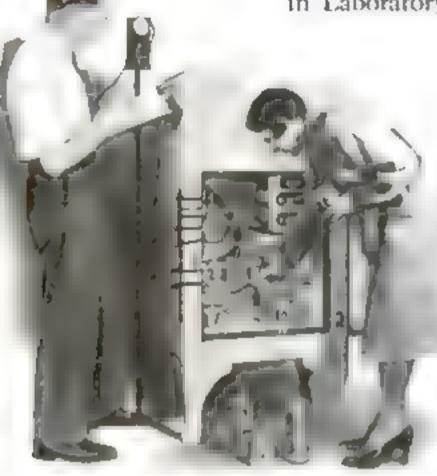
The vertically split window, seen to the circle, is the secret of a new a e-conditioning system for autos that, in the picture above, is being tested in the blast from plane's propel for

Home Utensils Guarded

Electrical Equipment Subjected to Severe Grueling in Laboratory That Searches for Defects in Materials

of your cookpot burns through, you may have just cause for complaint. To guard against such occurrences, some of the country's largest makers of electrical equipment cooperate in maintaining, in New York City a unique research organizar on known as the Electrical Testing Laboratories. Here a mechanical third-degree is applied to all types of electric accessories. Through the odd tests pictured on these pages, manufacturers learn what material for electric cords is most resistant to fraying and how to make

connection plugs proof against breaking.



WHERE IS YOUR REFRIGERATOR COLDEST? Did you know that the temperature into its your toll genetic varies at different points? By means of resistance thermometers, wired to outside gages, as shown above the degree of cold at any point in the relaterator to disterm ned. The tests are conducted in a concrete your lined with pipes so that any pass s



ROUNCING GOLF BALLE. Dut of the spout come the golf. be a mach as hing the floor in front of the mach ne. right boun og rim there to the center of the ama lable Any de fe t in the ball was heep it from an ing in the en er Carb n do s show exactly where the ball atruck Note how above the dicts are to each other

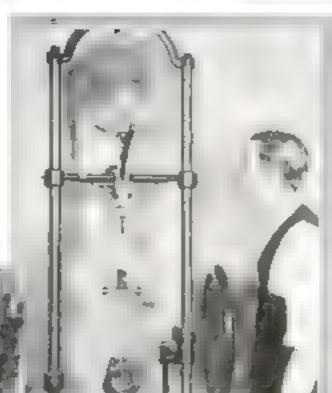
ELECTRIC CORD TESTED The apporatus, above, consists of a rotating cylinder covered with emery cloth Electric cords one end a tached to terminals on the mortine and the other hearing amail, weights are thrown over the cylinder. The amount of use that will wear through the insulation is thus found.

WEARING OUT ROASTERS A stream of sand for a cont ouously on the homem of a cook ing usens: Fight to cost the wearing quarry of he materia.



by Third Degree Tests





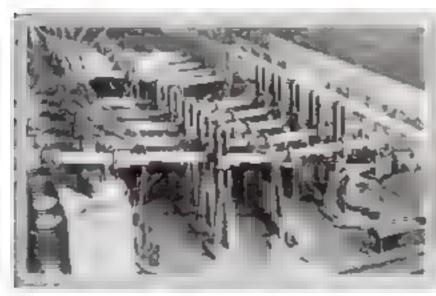
ANOTHER Cutes Table Berning and decision who you be extended by

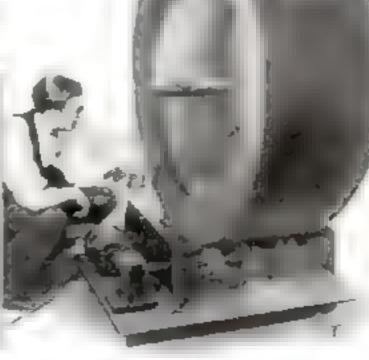


T PRAT T STS

COMP TROUBLE

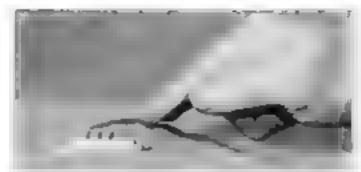
eNutrance T ST FOR Switches Switten self re you use over home are quincil a may rise with her may rap them make of 30 small a more The sa allowed a van there are weet no pources are chapted by the





DROPPING
THE PLOTS
The sema ke
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beak pe unic
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INCH-LONG SHIP MODELS WITH YARN FOR SMOKE show



How Navigators Escape Hurricanes



Arrows show harr conce recase to the left north of the equator and du the opposite way poorly of he

BEFORE Columbus
soiled holdly westward, confident of
reaching China in a
few days, and bumped unexpectedly into a new con-Lineat, the particular perils of the western Atlantic were anknown. It was called "The Sea of Darkness," because no one had met its dangers

But the voyagem and map-makers of 1402 had good imaginations, and their fancy peopled this Sea of Darkness with monsters that

could smash entire ships at a single crunch of their jawn,

These destructive creatures did not, of course exist in the Sesh-and-blood forms in which the early map-makers pictured them but they did have a real and terrible existence in the dreaded West Indian trop-

ical hurricane!

No monster could have wrecked ships more thoroughly than they. Columbus impself had a narrow escape from a troptent hurricane in 1+92 and may have contributed his observations on this type of storm to the fund of information navigators have been collecting about it ever since that historic voyage

Gradually, through bitter experience akippers learned something about the shape and habits of the hurricanes that so frequently occur in the Caribbean Sea.

They found that the storm was of cir-

cular form and that the winds blew into at from every point of the compass. They discovered that these winds spiral in from all sides toward the center, becoming more and more violent until the middle is reached. But at the center they found a comparatively calm circle, sometimes only twenty miles or so across, and often

with a patch of blue sky over it! This center was called "the eye of the storm."

Also, the navigators eventually noticed another peculiarity of the horricans, which proved to be the most important of alin the Northern Hemisphere the storm always cotates from right to left, in the contrary direction to a clock's hands. In

the Southern Hemisphere, they which the opposite way, that is in a clockwise direction.

This was such a remarkably regular habit that thoughtful ship captains seized upon it as the one thing that could be precheted about their behavior It seemed to them that the invertoble counterclockwise whithing of a West Joshan harrienne might be made the basis of some rules by which a skipper could get out of a storm's path.

This proved to be true, but the rules did not become uniformly reliable until another important fact was noticed by a Dutch scientist named Buys-Ballot His discovery was thu: He found that if a sea captain stood on the deck of his steamer with his back to the wind (with the smake of the funnel streaming straight away in front of him), the



With the aid of this diagram you can lucate the center of a thronder status by not of the d rection to which the wend shifes. With your back to the wind your entended telt tem will point in the direction of the approaching morm

You can see on the pictone at right, how the amote trails from the ne steamers in the ne ghborbood of a West Indian butt cane aparel unto the storth and usd care the direction of wind around it



By

GAYLORD JOHNSON

Captains Can Now Dodge Sea Storms Through Knowledge of a Scientific Law That Has Ended Guesswork by Sailors

center of any near-by storm or low pressure area was always on his left hand.

Buys-Ballot a discovery gave seamen a clear understanding of the behavior of West Indian hurricanes and the East Indian typhoons. Still more important, it showed them the way to maneuver their ships out of the path of any storm that might approach them.

To make Buys-Ballot's law, and its application to a ship clear, I made a map of the Caribbean Sea and several t my models of steamers. To the funnel of each ship, I glack a strand of black knotting years representing smoke. This black strand could be laid out on the map to indicate the wind direction at the ship's location

The smoke-trails of the six little steamers on the map show how the winds at all points surrounding the low pressure area how toward the storm and spiral into it in the "counterclockwise" direction.

You will find it interesting to verify huys-Bailot's low for yourself. Try it on the very first rainstorm that comes along. When the wind shifts in the same direction that the hands of a watch move, it is said to veer. When it shifts in the opposite direction (counterclockwise) it is said to back. Now you are ready to test Buys-Hallot's law with a thurderstorm.

Suppose it is a hot day, and the wind springs up from the south, If you have an aneroid barometer you look at it and find that it has begun to fall. A thunderstorm is somewhere in the vicinity. In which direction is it? Buys-Ballot's law will tell you.

Stand with your back to the south wind and extend your left arm. It points to the west and indicates the direction of the thunderstorm.

Now suppose that the south wind veers into the southwest, then into the west and finally into the northwest. Where is the storm while the wind is shifting through these points of the compass?

If you stand with your back to the wind while it is shifting and keep your left arm extended, Boys-Ballot's law tells you the position of the storm center

When the wind was south the storm was to the west; when the wind veered southwest, the low pressure was northwest of you; when the wind became west, the storm was northward, and when it finally been from the northwest, the thunderstorm was to the nurtheast of you. In other words, the depression passed by to the north of your location.

If you live south of the equator, you need only extend your right arm instead of your left in verifying Buys-Ballot's law.



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Simple Law
Helps Captains
Avoid Storm

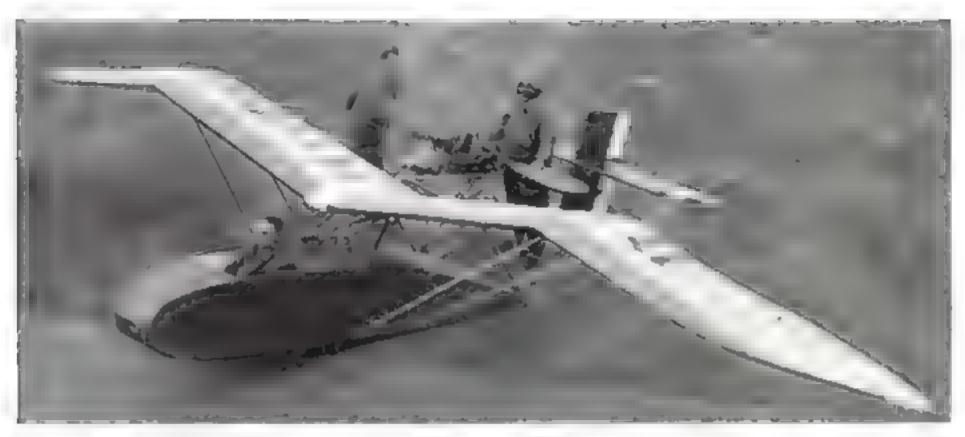
How Sculptors Put Life in Granite



Secret Trucks of ran Art Taught in Umisual School that Uses the Octabors as a Classian for Saconts



Fire grant ere plent full et Wonsiede' und che young scoloors se eit he en worme ere Out of the place are the ng measure e him worme a hos of finden any



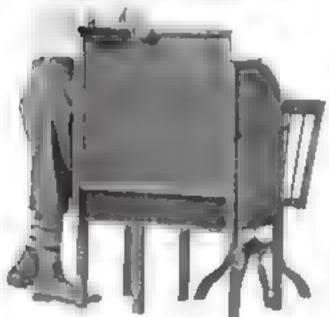
Bird-Like Plane, with Zigzag Wings, Meets First Tests

First trials of a curious bird-like airplane, recently held at a Bertin airport, were reported a success. The unconventional machine was designed by Hana

Richter, poted German aviator, to test the aerodynamic qualities of wrings of signag contour in comparison with the usual straight design. A motor no larger than a motorcycle engine, fed with gasoline from a small streaml ned tank and driving a susher propeller suffices to fly the featherweight traft



A blackhoard but I into this chief's deak bangs at the back when not in use but is use y awang ato pas uses at the least. It can be detached



DESK FOR CHILD HAS BUILT-IN BLACKBOARD

A CHILD'S desk with a built-in blackboard provides entertainment and instruction. The blackboard bangs behind the desk when not in use, but is readily swring into position at the front. If desired, it may be detached and used separately. The desk itself is of roll-top construction and is made of onk

PENCIL IS ALL "LEAD"

ALL "lead" and de void of a wooden casing is a new pencil that has appeared on the tharket. The stick of sould graphite may be given any desired type of point, or may be brought to a fine tip in a sharpener.



WATER SUPPLY CARRIED BY CITY FIRE TRUCK

CARRYING its own water and chemical supply a fire truck extinguishes brush tires and blazes caused by short-circuits on electric poles for the city of Los Angeles, Calif Power from the truck's own engine raises a telescoping tower to a beight of thirty feet, to give the firemen an elevated point of vantage, When not employed in fighting fires, the truck is used for the periodic cleaning of insulators, as shown in the photo below, and is driven with the tower raised



Carrying its own water supply the a truck fights first or can be used to clean electric insulators



TIED DOWN HOUSE IS HURRICANE PROOF

EVEN the force of a hurricane will not unroof the house of one Florida home owner, or sweep it from its foundations, for the house is tied down. After witnessing the disastrous experiences of some of his neighbors in wind storms, this man passed steel cables over his roof and anchored their ends securely in the ground. Turnbuckles provided a means of taking up the slack in the cables and making them taul. The photograph above shows the owner putting the finishing touches to his installation.

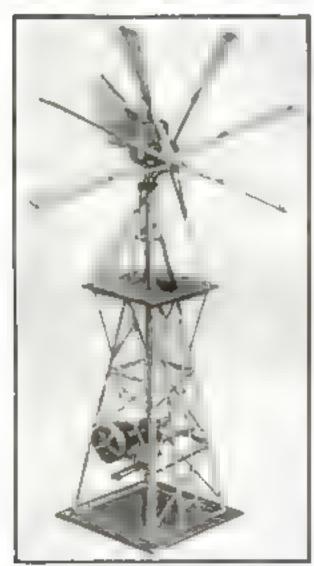
Russian Ship Fights Way Through Ice of Northeast Passage



That Read on p. with propeliers broken aght in way to agh he Nothean Passage

VANES ON WINDMILL REGULATE ITS SPEED

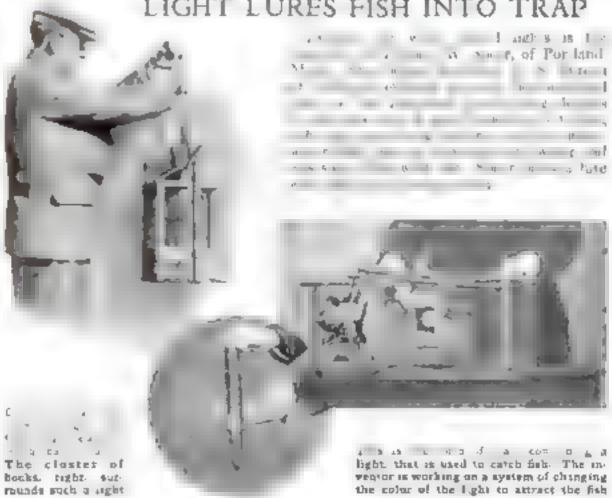
A SIR FR A A B a Pis a Street Street, Francis Park 1 N A Trape and a second to A re a second



Vappe that open and close with the force of the wind are designed to keep this windmile, recently invented, running at regular speed



LIGHT LURES FISH INTO TRAP

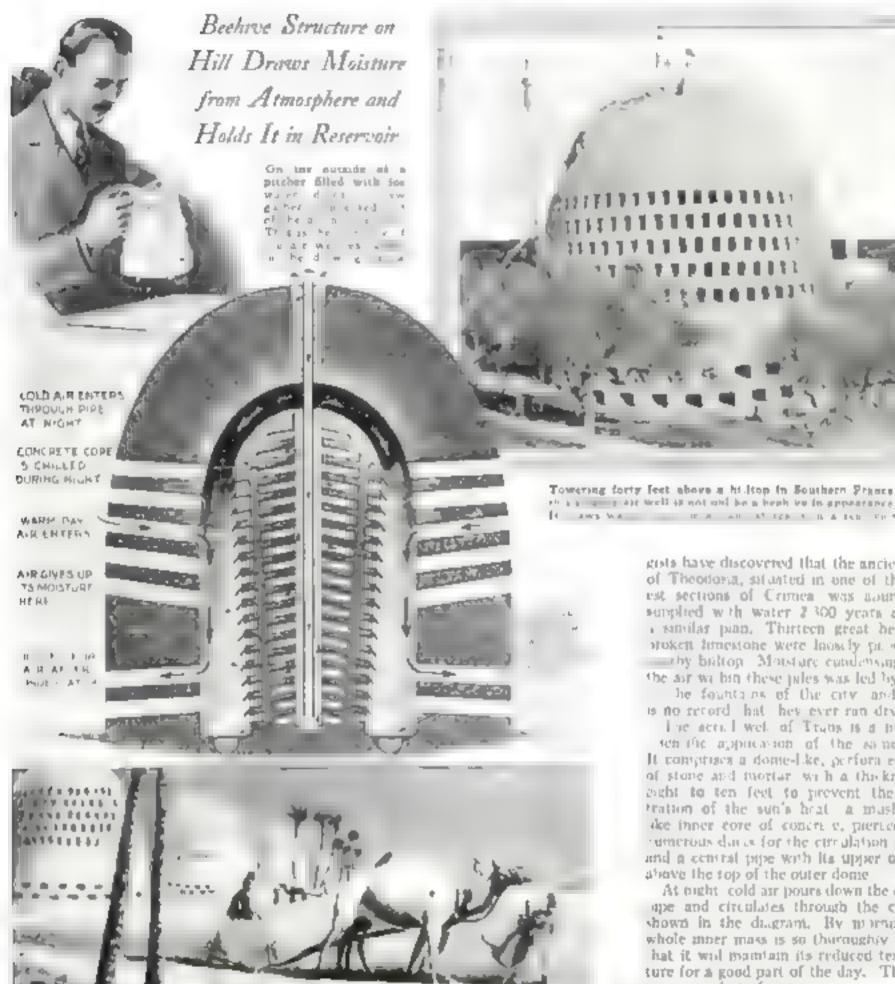


2/5 475 The Contract of the 45

III. came into purt it Yokohama, Ja---itter a 3,000-mae dash from Archangel Russia, through north polar regions and ran , ere tip of Siberia. It was to year a slup had naviga ed the The Nema ! I so go we hout spend ing the win er locked in the ice. For the crew of sixty-five, including three worn rn and a staff of scientists, the three month trip in search of a new commerand trade toute was filled with hazare. Before the slip escaped from the Arc v both its propellers were broken and soils

with a rope to the rog

Air Well Waters Parched Farms



Use of the air wade on a large scale is desert sections of Mortbern Africa, might transform the barren waste into a load of festale fields, as this drawing suggests

NTRACTING water from the air to irrigate fields and vince, an accomplished feat in southern invention called an aerial well have just met with complete success.

Towering forty feet above a hilltop overlooking the little town of Trans-en-Provence, this remarkable structure resembles nothing more than a monster beehave. Its grayish-white walls of stone are perforated with scores of openings. Warm putdoor air entering through these ducts

is systematically robbed of its mosture by contact with the chily interior, much as dew condenses on a pitcher of ice water.

While the present well is an experimental one, the inventor, M. A. Knapen, foresees that practical application of the idea will transform parched regions, like the and lands of north Africa, into blossoming fields. Droughts that have killed great berds of livestock in these areas would be things of the past.

Taking water from the air instead of the earth is not a new idea. Archaeolo-

gists have discovered that the ancient c'ry of Theodoria, situated in one of the dry est sections of Crimen was abundantly supplied with water 2 300 years ago by similar pan. Thirteen great beaus of stoken innestone were lausely paid on a by bilton. Moisture candening from the air we bin these piles was led by due a

to at an an age of the Alleh Con-T

he fountains of the city and there is no record hat hey ever run dry

I've acts I well of Trans is a mouern ten the application of the same idea. It comprises a dome-like, perfora ed the I of stone and morter with a thickness of eight to ten feet to prevent the pretration of the sun's heat a mushroomdee inner core of concre e, pierced with tumerous datas for the circulation of a tiand a central pape with its upper opening above the top of the outer dome

At bight, cold air pours down the central. ape and circulates through the core shown in the diagram. By morning the whole inner mass is so thoroughly this hat it wol maintain its reduced temperature for a good part of the day. The we

is now ready to function

Warm moist on door air enters the central chamber as the daytime temperature rises, through the upper ducts in the outer wall. It immediately strikes the chilled core, which is studied with rows of slates to increase the cooling surface. The air, chilled by the contact, gives up its moisture upon the slates. As it cools, it gets heavier and descends, finally leaving the chamber by way of the lower ducts. Meanwhile the moisture trick es from the slates and fails into a collecting basin at the bottom of the well. By this principle, the inventor believes it possible to obtain as much as 6 000 gallons of water daily for every 1,000 square feet of condensing surface

Trailing Rare Crystals WITH A MICROSCOPE



For must crystal formations, .. a arty sah a to swing a ower powered objective into poor son sode at the new done, in the photoshove. This gives a wider view

The attaces genmatt Las Spures at right are the crysta a of po-La decome à all bhâte. as seven under a microscope The crystals are more beaut ful than he the walkers because thru pasty up the light and see gay with color The pay ng stone figure at tell to bns t se common at a not fler bur is almost a perfect cube s. sabity

distursed by he

notifice digital on

EAUTY of form and color reigns principal forms—the crystalline and the supreme in the strange world of amorphous. Graphite and tale are memcrystais. Into this exciting labbers of the amorphous category. The crysorators of nature, where mathetalline, so beautifully represented by commatical exacticude is the law we are now mon table salt, is distinguished by the ready to enter. Here we shall find gefact that its molecules, when they are ometry blended with art-a combination normally associated, take certain definite making a powerful appeal to the searche positions that result in the formation of and the esthetic. And the key to this many types of crystals, some of them marvelous world of crystals is the lens cubes, others oblong, hexagonal, or octagonal. Crystalline matter is really made up of countiess millions of smaller crys The instrument we use need not be cuborate. One that multiplies fifty times tals, all in perfect geometrical relationship

win meet our needs. In the examination to each other of most crystal forms high power 5 2 First, let us prepare a supersaturated t Badya Mage as may you the form, long solution of (able falt, By supersaturated we desire a ser in fairly large. It show if we mean that the hot water has dissolved be borne constantly in mind that the salt until it cannot take in another bit higher the power of the lens used the A microscope slide is wiped clean and a smaller the area covere. The really high few drops of the supersaturated solution powered in croscopes thus all oil us a seet. of table salt are placed upon it. This is at only a few thousand his of an each at a then set aside for a few minutes to dry tirde of the specimen ancer the lebs When we return to it we shall find that In surring a spoon if of sugar in colthe water has evaporated leaving a few tiny crystals. fee or sprink ing a hand of salt in con-

> The shde is placed on the stage of the microscope, under the two little clips, so that the salt crystals will be directly



torms taken by crystem of different sub-

over the bole in the stage. The light is turned on and the mirror under the stage adjusted until a soft glow is produced Now the objective is brought close to the surface of the crystals and the instrument focused upward until we see a number of little cubical genu, the box-ike crystats of table sait. They have lost their perfect cubical form because a certain ameunt of distortion in caused by the soud articles with which they were in

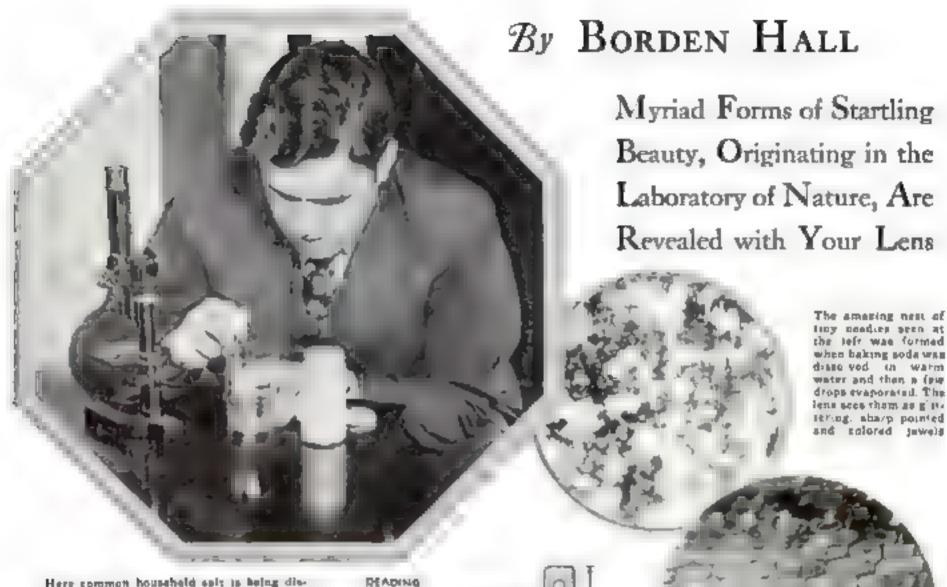
contact while forming

All crystaline substances are classified, physically at least, according to the geometrical forms assumed. Alum takes the torm of an octahedron. Those not acquainted with an octahedron are referred to Figure A in the drawing on this page Figure B shows the shape taken by the crystal of quarts. These crystals are members of what has become known among the students of such things, as the Regufar System and the Hexagonal System.

In our microscopic examination of crystal forms, we shall find that some crystals are much larger than others. We may be surprised to know that crystal may be grown from seeds to very large sizes, so lante, indeed, that we need no microscope to examine them. Today radio stations are kept on their proper wave lengths by large crystals of Rochelle salts. These have the currous property of expanding

soprimé we are unw ing v des roying millions of thy spark ne gents Nature has givinger bloss so a con- of the two

of your microscope



TOUR BRADTZ & ZADB

ALLOW GLASS TO

Here common household only in heing disnoted in hor water. Afterwards, a tree drope will be placed on a slide and telt to dry. Then the crystale can be studied

and contracting at a definite frequency when excited electro-statically by radio currents. These crystals, so useful commercially are developed from tiny seed crystals in the laboratory

A supersaturated solution of ordinary baking soda is prepared exactly as was the sail solution. Again the slide is adjusted to the stage of the microscope and again we look at the result. Here we see cryatals taking a need r-like form. We have left the Regular System. If we can obtain a bit of the mineral taking (Figure F), we shall enter the Trigonal System. Quarta (Figure B) is a member of the Hexagonal System. Although quarts does not offer a very striking sight under the microscope, its industrial and domestic uses make it a most interesting substance.

Due to the manner in which nature has arranged the tiny bricks in quarts, it will pass tatra-violet light, which is kept out by ordinary glass. Cameras with quartz lenses will take pictures in perfectly dark rooms provided acting, or ultra-violet, light is present. Windowpanes of these crystals are now used in hospitals and homes so that the full value of sunlight may be enjoyed.

Reference to the outline of crystal forms will acquaint us with the Rhombic System of which sulphur is a member. If a bit of melted sulphur is apread thinly upon a clean glass slide, it will crystalize upon cooling and we shall get a display of golden gens. This little smear of liquid sulphur on the plate, however, must be thin enough to transmit light.

It will probably astonish us to learn that great crystals of copper have been formed and are used to demonstrate properties in the meta, that cannot be observed under other conditions. Such crysmounted as the diagram shows, is used to throw the light on the surface of a crystal spacementhat does not transmist light

A ceading glass A

tals have been built up to a weight of several pounds

Potassium permanganate or potassium intrate will supply other members of the rhombic system, the potassium permanganate being perticularly beautiful under it powerful transmitted light

But a far more exciting form of crystallization beckons us. It may be truthfully said that beauty, in its farer forms, is unknown until we study the crystals of ice. Perhaps we have heard that snow-flakes appear in an infinite variety of shapes and designs. Then architecture is one of the great wonders of the world, but we shall have to change our technique if we are going to examine them for here we are dealing with highly perishable objects.

So we must take the microscope and its light source to the garage, the woodshed, or better, right out of doors. If either the garage or the woodshed is chosen, it may be necessary to use artificial light. If so, remember that it cannot be too powerful nor too hear the

When a bit of roal is magnified 200 times it looks tike this and reveals to plant origin



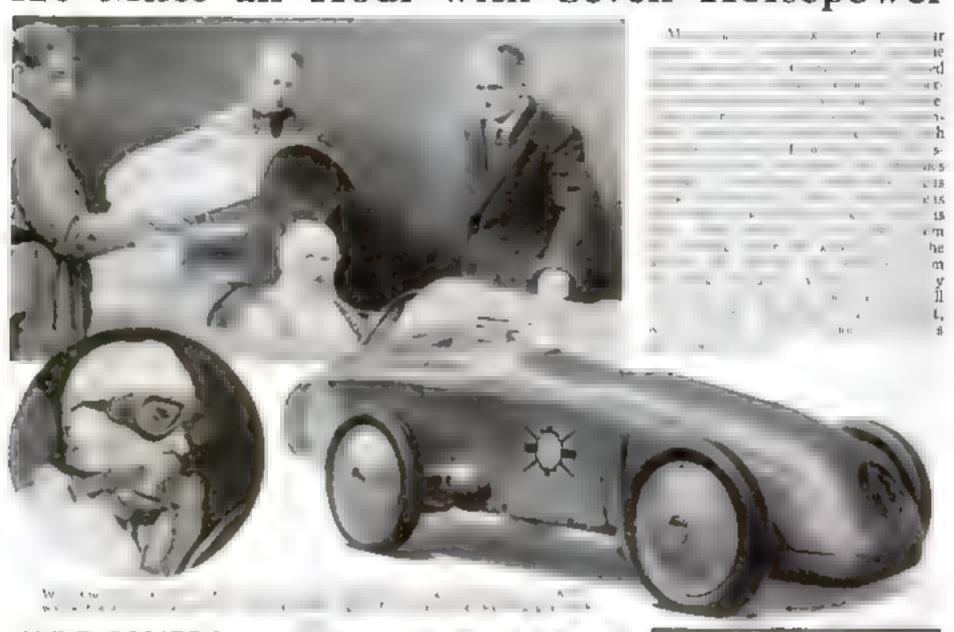
Two'diagrams above show how light is dispered on to a crystal specimen. At right, light on opeque quests and left, light on transparent object

instrument. Otherwise the flakes will melt before we can get them under the lens for observation

The shdes to be used must be chilled to the approximate temperature of the flakes. This is done by placing them in snow and leaving them there for half an hour. Then one of these sades is laid out where the failing flakes will settle on it. Flakes cannot be taken from the ground for there they are inextricably entangled with others and will be broken and destroyed before they can be brought to the stage of the matrument. Experience teaches that a dry, cold snow, without wind, provides the best flakes.

Snowdakes are examined under the microscope in the same manner as any other crystal that (Continued on page 84)

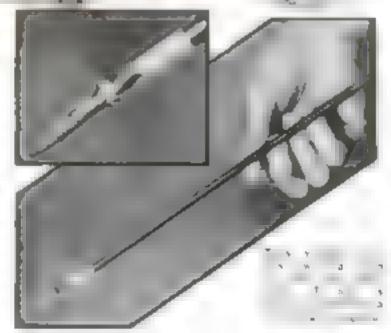
120 Miles an Hour with Seven Horsepower

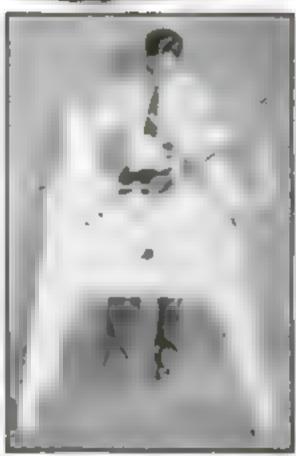






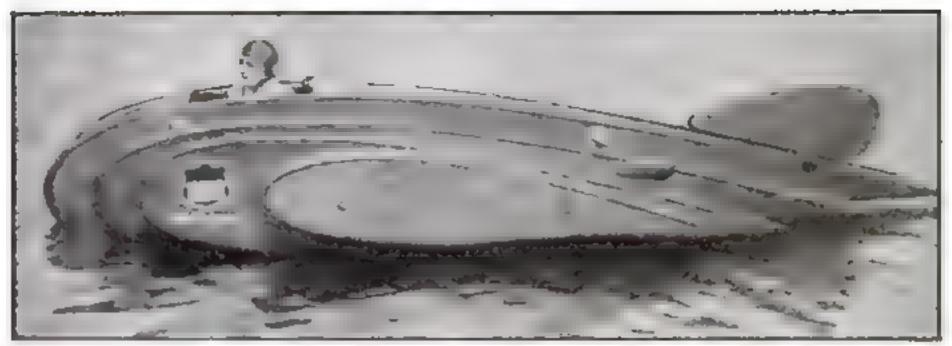
The second second





CASTINGS QUICKLY MADE IN MECHANICAL FOUNDRY





This new type boat, with wing the fine reas to nearly clear at forty five pures a

Sea Gull Boat Skims Water at Seventy Miles an Hour

Skimming the surface like a guis speed hoat that rises clear of the
water has just completed its first
trial runs successfully at Marshbeld Ore
It resembles a hybrid between an airplane
and a water craft Plywood-covered fins,
shaped like airplane wings, extend from
the sides in three successively smaller
steps. By Litting the boat into the air
they virtually eliminate water friction on
the hull and permit seventy-mile-an-bour
speed without using unusual power

Seated behand a small windshield in the one-man cockpit, the pilot operates a lifty-tive borsepower motor of outboard type that drives the new boat It behaves the an oremany craft until it attains a speed of forly-five miles an bour. At this velocity, which corresponds to the taking-off speed of an airplane, an abrupt change occurs. The pilot can feel the boat rise from the water as the first take held on the air. Only the propeller beneath the ull remains in the water where its ful-

thrust is effective. A small water rudder used at slow speed is now meffective, and on air rudder, resembling an airplane tail fin, steers the boat. Most notice

able to an occupant in the absence of the bumping sensation experienced in fast water craft. The cushion of air between the hull and the water surface acts as a shock absorber; the boat is literally riding on air.

Other advantages of the strange craft are pointed out by the inventor, Victor W. Strode, of Portland, Ore., who has been granted a patent on the unconventional design. The boat turns in an abnormally short radius, with little tendency to tip. It possesses unusual stability largely because of the care with which the propeller was placed after a series of experiments—about one-third of the way back from the bow of the boat to the



This was of the amening speed hear shows it turn before the instructure of the third and amplifies pair of its wing-like fine

stere. Complete stream ming minim sessif resistance and fuel consumption. While the hull weight twice as much as one of standard type, its extra weight is more than offset by the lift of the wings.

Since the first model is an experimental one, the inventor has made no attempt to provide scating accommodations for passengers I staccess in further trials may presage the baseing of amelia, larger that with enclosed passenger cabins. They would be suitable for use as pleasure craft, as mail or naval dispatch boats, or for high-speed passenger transport over inland water routes and might be used for express service for commuters.

NEW TUBE CONTROLS VOICE IN PHONE



Vacuum tube, shown in place in telephone, controls the tone volume

No LONGER need you ask a phone caller to speak a little louder, when n new adjustable amplifiet is a tached to your receiver. By adjusting a simple control that operates much like the volume knob of a tadio set, the voice, in the receiver. may be made load or soit at will. The change in volume is accomplished by a small yacuum tube, to which the girl in the photograph is pointing



CAR'S STEERING WHEEL IS INSTRUMENT PANEL

ALL the instruments needed for ordinary driving are mounted directly on a new automobile steering wheel. In this position they are plainly visible. Connections to the instruments are led through the hollow post of the wheel.

Specially Designed Trucks Speed Door-to-Door Deliveries



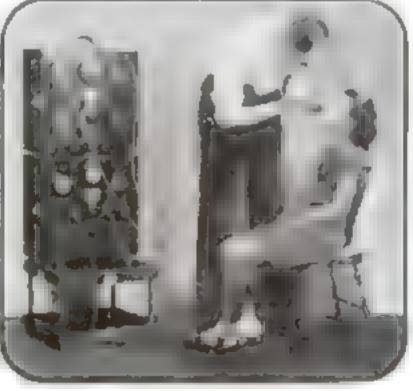
quickly replaced with a spare.



to speed the milkman, the baker, and

WINDPROOF SUIT TO AID MT. EVEREST CLIMBERS

Wixpenoor suits will be used by mountain climbers next summer, in a new altempt to reach the 29,141-foot summit of Mount Everest in Asia. The costume is scient ficially designed to give protection from key blasts. Members of the expedition will carry oxygen tanks.



No where pre attached to this new rad o ho fe which gets its cor the from electrodes on the patients back

FROZEN FISH ALIVE WHEN THAWED OUT

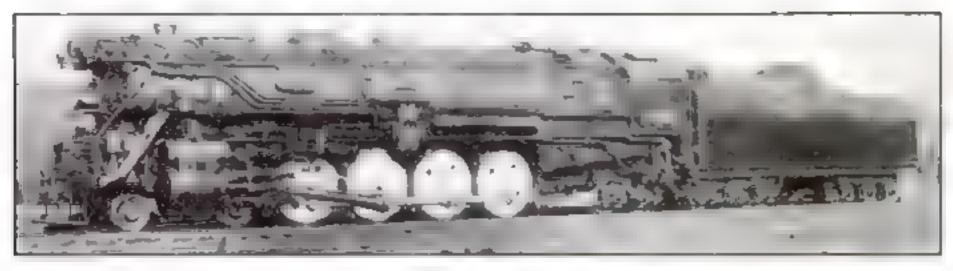
FREEZING live Volga River sturgeon in Russia, and thawing them out again to be sold alive in inland cities of America, is a possibility forecast by recent experiments of Dr. N. A. Berodin, enunent Russian hiologist at Harvard University. To learn how low tempera ares affect byhhe places them in a special electric refrigerator and freezes them alive. In one test, an Alaskan blackfish was frozen in dry air As shown in the photograph, it. (hawed out and swam two minutes after being dropped in water.



NO WIRES ON RADIO KNIFE

ing up, one podal works hake and controls append

SUBGRONS had a new radio knife, devoid of wires, as an outstanding advance Previous types have long employed high-frequency currents like those of radio, led through a dangling cord to make clean bloodless cura in tissue. The latest appa ratus dispenses with any electric connection and leaves the surgeon's bands unencumbered in a delicate operation. An insulated eletrode behind the patient's back charges his skin, and the surgeon's scapel absorbs enough energy at the point of contact to divide the turque cleanly

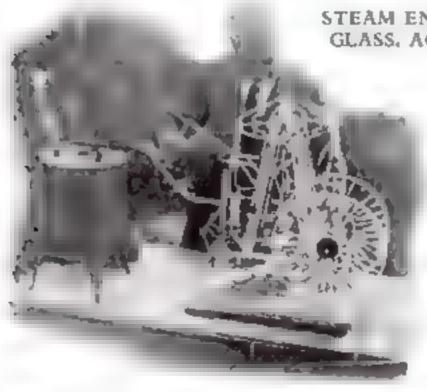


Powerful Locomotives Are Now Equipped With Disk Wheels

DISK wheels have appeared as an in- spokes and their reduced weight lessens novation upon locomotives of the New York Central lines. The new drivers are reported to be cheaper than those with

the wear on rails. Each wheel is formed of a pair of disks, encureled by a standard ture of metal. The photograph shows the

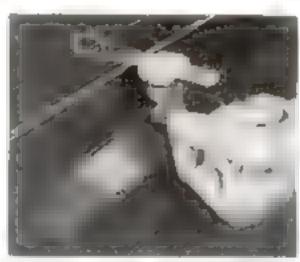
striking appearance of the first of the locomotives to be equipped with the new wheels, others will be transformed when they come to the shops for repair.



John T. Backman proves that the steam engine he built entitely of polored g are, will actually run when a tiny bouter supplies steam

STEAM ENGINE, BUILT OF GLASS, ACTUALLY RUNS

A CALIFORNIA RIDIS blower, John T Backman, has just com-pleted an intricate glass model of a steam engane. He began work on the unusual engine two years ago as a spare-time hobby. Alithe mechantsm, including pistons, cylin lers and bearings is made of glass. Fed by steam from a small boder, the remarkable model actually runs and develops an appreciable amount of power. Fifteen differ ent colors of glass were used, giving the completed gagine a striking appearance



THIS PORTABLE LOCKING DEVICE FITS ANY DRAWER

DRAWERS may now be guarded with a portable locking device. A flat steel bar with a hook-shaped end, is slapped above the partly-opened drawer and engages the partition above it. The drawer is then closed and the lock, shoped over the suitched end of the bar is pushed home. On y the proper key can upon the grawer

NEW RATCHET WRENCH FOR TIGHT PLACES



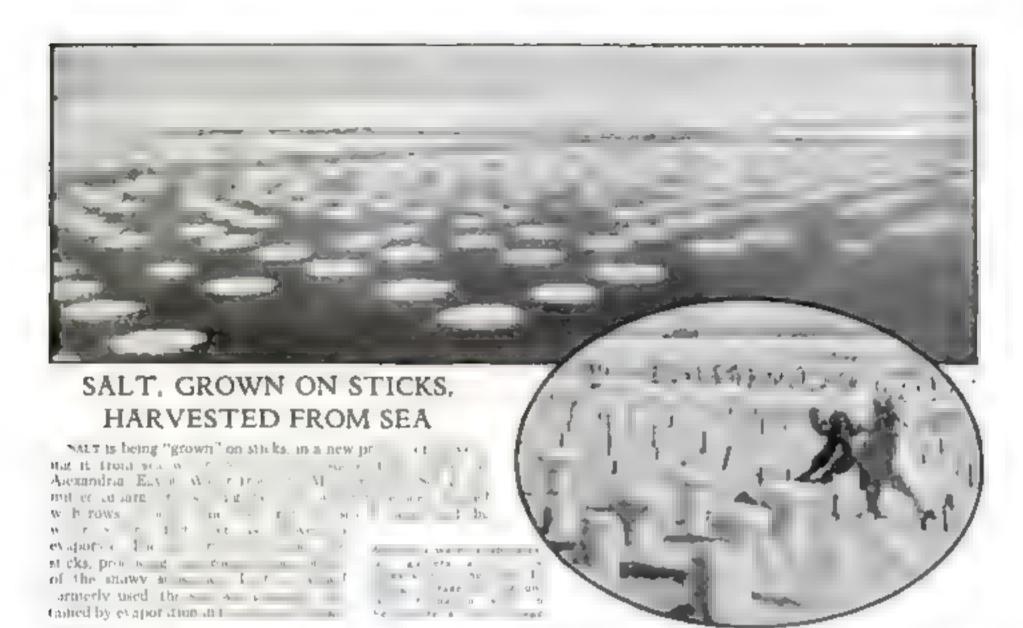
ESPECIALLY SUITed for work in cramped quarters, a new fine-toothed ratchet handle for a socket weench will take a bite as small as one-seventigth of a complete turn. This compares with a bite of one-tenth to one-twentieth of a turn previously available in such a tool, according to the maker. By turning a knob, the ratchet handle may be reversed without removing it. A slightly smaller model that contains sixty teetb. has been put on the market

BIG SHIP'S RADIO HUNG ON SPRINGS



Swong on spring cables this radio is the Italian Liter Rea is so we a guarded from vibrations that his range is greatly extended

A made out fit hang on springs enables passengers of the S. S. Rex. speedy Italian superlinee, to converse by radio with menda 4,000 miles away The cradic of coil springs guards the sensitive set from the vabration of the propellers and the shock of the waves dashing against the slup as it speeds through the water A battery of seven transmilitera provides commumealion on any desired wavelength from eighteen to five thousand metem, while radiophone communications are received on a thirty-seven tube set that is said to be at least ten times as sensitive as the average home broadcast receiver The set is also well guarded against static.





TINY CHECK PROTECTOR FITS IN THE POCKET

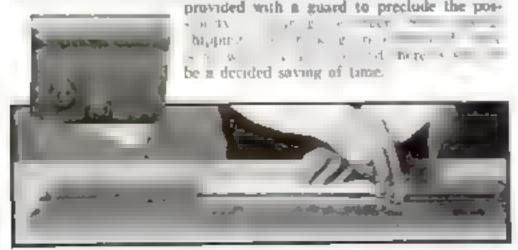
A career protector, that may be carried in the pocket, guards against fraudulent erasure or raising of the amount. After writing a check, the user slips it into a groove in the device. Drawing the check protector to the right, across the handwriting, perforates the paper with a poir of cog-wheel rowers and makes any olteration instantly visible.

MIDGET PROJECTOR FITS PALM OF THE HAND



GROOVE GUIDES WOOD CUTTER BLADE

ESPECIALLY designed for the model maker, a new tool makes it easy to cut strips of light material, such as balsa wood, accurately to size The blade slides along a straight edge, guided in a groove it is



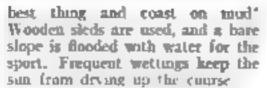


FLEXIBLE KEY

To rote the lock-packer an ingenious German invenor has devised what he terms a "dragon kes. The odd key as flexible, and is composed of a number of jointed sections, I is pushed without difficulty into the crooked keyhole of the special lock with which it is used. When the key is turned, projections on its sides operate the tumblers of the tock. So warped is the key bole that an ordinary key can not be inserted.

NEW ZEALAND BOYS COAST ON MUD

AMERICAN boys wait for a good snowfall to get out their sleds, but any day is a good day for coasting in New Zealand. Snow is a rarity in the even, bracing clamate of the islands, so the youngsters do the next





EXTENSION LADDER AIDS IN UNCOVERING RUINS

A TWENTY-Executy from extension ladder was recently pressed into service by P. L. O. Guy, University of Chicago archaeologist to aid him in directing the work of excavaling 2 300 year-old rains at Megidia Palestine Observations and photographs from the high point of vantage enable him to distinguish one layer from the next as the digging progresses.







TRACTOR MOVES AN ENTIRE HAYSTACK

TIME-HONORED ways of making hay are brought up to date, according to a Scotch farmer and inventor in a method that be has just devised. The hay is first stacked on special metal tripods, allowing free ventilation but guarding the contents of the stack against the weather. After a sufficient time for open-air curing has

elapsed, a tractor backs up to the stack and picks it up bodily, using an ingenious lifting framework with small wheels and sloping times. Two men with the tractor can thus gather a crop that would require eight laborers to harvest under the olumethod of removing it from field to wagon and thence to the kayloft.

New Mechanical Devices

PERFUMES CLOTHES

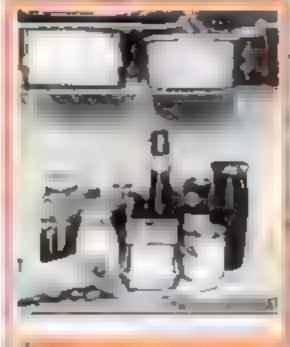
As a flatters in pushed over the block of parathe, shown below, it is lubricated so it moves easily over the clothes and as the parating is perfumed, a tweet scent is added to the garments. The sheet of anbertos, made into book form, serves as an iron rest.

TAKES OFF CRUST Slowly pushing this too be a conf of bread as far as it will go, removes the one to crust at once. This leaves the loss all ready to see in making round pendwiches



TAPE IN PRONE DIAL CARE A tops fifty feet in length is enclosed in a case designed like phone dial

CLOCK RUNS CAS HEATER. With the clock control device shown below. In gas beater to turned on or off. It can be not to heap the gas burning for any desired time up to an hour



REPRIGERATOR COM-TENTS RASY TO GET AT Bottlee. jurs, pots. butter eggs, or any small item can be placed on this revolving lable which fits to the release erator. They are then easily a estible as the table will be want them within your reach

> LIGHT IN PLAT-IRON The Historiation of the right shows both a sight in permanently attached to a flat rou and provides enough illum nation to work by mithous toroing on add tonal bulbs. The sweether for controlling the iron and the light are touveniently—placed



ROAST YOUR OWN COFFEE Green brann of cofine are placed in this electric robust; the t ming ewitch eat, and the machine pulposatically reasts the beaut so the bousewife can always serve fresh coffee





Make Housekeeping Easy

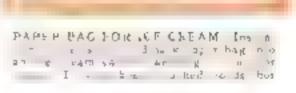






FFOTAC S VOLK FOOD Cr sren

E so



Home Laboratory Stunts





The blue flame of a Butten burner is colored a pleasing red when the apray of a caucium chamical is activities is passed through it

O ONE would think of using a send pipe for kindling. Yet, with est tube and burner, the amateur chemist can prepare lead particles that mysteriously will burst into flame when they are exposed to the air.

This is only one of the many fascinating experiments with metals that can be performed with inexpensive apparatus in

the home laboratory.

Place some lead tartrate in a test tube and beat it until all the vapor has been driven off. The resulting substance will be finely divided lead that will catch fire when the small particles are pouted from the tube. Hold the test tube high and gradually tilt it. The lead particles will apark and glow as they fall to the floor.

If desired, the test tobe, after heating can be tightly stoppered and laid aside. When it is opened, the lead within it will catch fire if it is poured into the air.

If your stock of chemicals does not include lead tartrate, it can be made by muxing a solution of lead nitrate or lead acetate with a solution of tartaric acid or cream of tartar. The lead tartrate will be formed as a white precipitate

Allow the white powder to settle to the bottom of the beaker and then carefully pour off the top liquid. Wash the lead tartrate thoroughly by adding water, shaking it, and allowing the precipitate to settle again. Then carefully pour off the wash liquid and repeat the process several times. The solid lead tartrate can be obtained or her by filtration or by slow evaporation of the water that remains.

Finely divided from that will burst into flame in the same way can be made by the home experimenter. The from is prepared by passing hydrogen gas over bot from smalate. Place the oxalate in z glass tube connected to a hydrogen generator.

As the gus is formed, heat the tube containing the iron oxalate

Be sure the hydrogen gas has expelled all the air from the system before applying the Bunsen flame to the tube. Hydrogen and air form an explosive mixture that will be ignited by the heat of the flame

A formation of aron in a similarly active state sumetimes is found on the iron hoops that hold vinegar barrels together. The vinegar, account through the

wood attacks the fron and forms a substance that appears as small lumps and knots on the surface of the metal. Generally these can be ignited with a match.

THE fact that metals and salts of metals burn with flames of various colors forms the basis of colored fireworks. Strontium intrate, for instance, is used in the manufacture of red flares because it burns with a vivid crimion flame. Powdered magnesium or aluminum will burn with a brilliant white flash if thrown into the blue flame of a Bunsen burner For this reason, magnesium forms a part of the flashlight preparations used in taking indoor photographs

Socium compounds, such as salt (sodium chloride) and baking soda (sodium bicarbonate), color the flame of a Bunsen burner yellow. Similarly, calcium compounds color the flame brick red while barium salts produce a greenish hue

A novel, and interesting way to demonstrate this property of metals is to dissolve a carbonate of the metal in a dilute acid and allow the spray formed by the reaction to be carried up through the air port of a Bursen burner

For example, place some marble chaps



nature of ten, if a drop or two of couracte acid is piaced in the hottests of a to can. The resulting accounts will resemble the pattern of freel crystan on a window pane

Tarm shed silver can be cleaned easily with this homemane apparatus consisting of an aluminum pan con terming a sail solution toto which the silver is placed.

calcium carbonate) in murin.ic (hydrochloric) acid, using the gas generator described in a recent issue (P.S.M. Aug. '32 p. 60) as the container. Then bring the small air port on the side of your burner over the mouth of the bottle. The mist of calcium chloride will be carried up through the port and into the blue flame, coloring it red. This red color is peculiar to all calcium compounds.

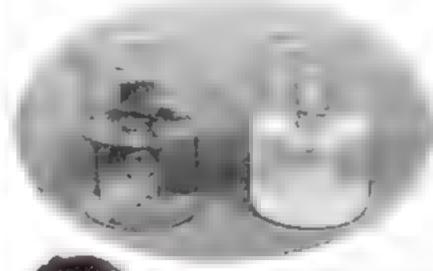
Obviously, since metals impart characteristic colors to a Bunsen flame, burning is a simple means of testing for their presence. In this way, sodium intrate and strentium mitrate, two chemicals that look alike, can be distinguished from one another by holding a loop of wire containing first one substance and then the other in a blue flame. Sodium chemicals, we have found, color the flame yellow while strontium gives it a crimson color

Two thre metals, platinum and palladium, when prepared in a special form, have the peculiar quality of being able to adsorb gases with such vigor that they become red hot. A thin wire of either of these metals, held in certain types of illuminating gas, will get so hot that it will ignite the gas. The same in true when they are

held in gasoline vapor

Burning Lead or Iron is Easy After You Have Made Correct Preparations Which Require Simple Apparatus

By RAYMOND B. WAILES



Joseph beater of destind water mate profiled to placed and sate absolute beat a series of the profile beat and the placed to the profile beat and the placed to the placed

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Use of this property is made in one type of commercial gas aghter and cutarette lighter. In the cigarette fighter, the fine wire is lowered into a cylindrical wack saturated with gasoline. The vapor causes the wire to get red hot and ignite the vapor and the wack

If THE metal so such a lighter becomes inactive, it can be returned to its originally active state by heating it in a flame to drive off the desorbed gases.

In a recent series of experiments demonstrating distillation (P.S.M., Jan. '33, p. 48), we learned that distilled water is free of impurities. It would seem reasonable to suppose then that distilled water would have little effect on a metal as inactive as lead. This, however, is far from the truth. In fact, lead is attacked and quickly dissolved by distilled water while it is not dissolved by tap water which invariably contains other chemicals.

This can be shown by placing a small strip of lead in a beaker of distilled water and a similar strip in another beaker containing ordinary tap water. After some time, the distilled water will become cloudy—a white precipitate will be formed.

The chemicals dissolved in the tap water, however, combine with the lead and form a protective coating that prevents any further reaction.

This experiment shows graphically what happens when soft and hard waters come in contact with lead piping. Soft water can be likened to the distilled water since it contains few dissolved chemicals.

Similar to the magic lead tree described some months ago (P.S.M., July '32, p. 60), is an artistic formation of tirt crystals that can be grown on the bottom of a tin can.

As we know, a tin can is not made entirely of tin but of iron coated with tin. Tin is used because it is inactive to the various acids and the oxygen inclosed in the ran. It is this thin coating that supplies us with the tin for our tin tree.

Place a drop or two of munatic acid on the bottom of the can. Almost immediately, a leafy-like growth of tin crystals will be formed. You will find that the structure resembles the fan-shaped patterns on the surface of a frosted window pane.

SHEETS of metallic tin have been exposed to most air for years without tarnishing in the least. It is on this nontarnishing quality and its particularly low melting point that the commercial uses of tin depend

Although not a metal, sulphur also can be prepared in a crystalline form.

Perfect crystals of sulphur can be made by meeting sulphur and allowing it to cool until crystals appear on the surOn pouring off the substar, which if in the liquid form, the solid part was east as long natrow, prism-shaped.

This form of substar is known in supstar.

Bismath behaves in the same way. To the he crystal me structure of this at it in the shallow it of a tin an, such as it used for haking powder, and brat it over an alcohol or cancle flame. The crystals of bismath will form when he resulting liquid is allowed to cool.

When you perform his experiment, you will find that no great amount of heat is required to melt the bismuth. It is this property of bismuth that makes it the principal logredient of an alloy used as the fushie plags in automatic sprinklers.

IN OUR experiments in electro-chemistry (P.S.M., Dec. '32, p. 58), we found that an electric current is formed when two different metals are placed in a soutton that will conduct electricity. The bousewife can use a practical application of this simple process to clean tarmshed silverware.

Place the termshed silver in an alummum pan containing a hot solution of baking sods, salt or both. This combination, in reality is a simple cell where the aluminum forms the negative electrode, the silver becomes the positive electrode, and the baking sods or salt solution is the electrolyte.

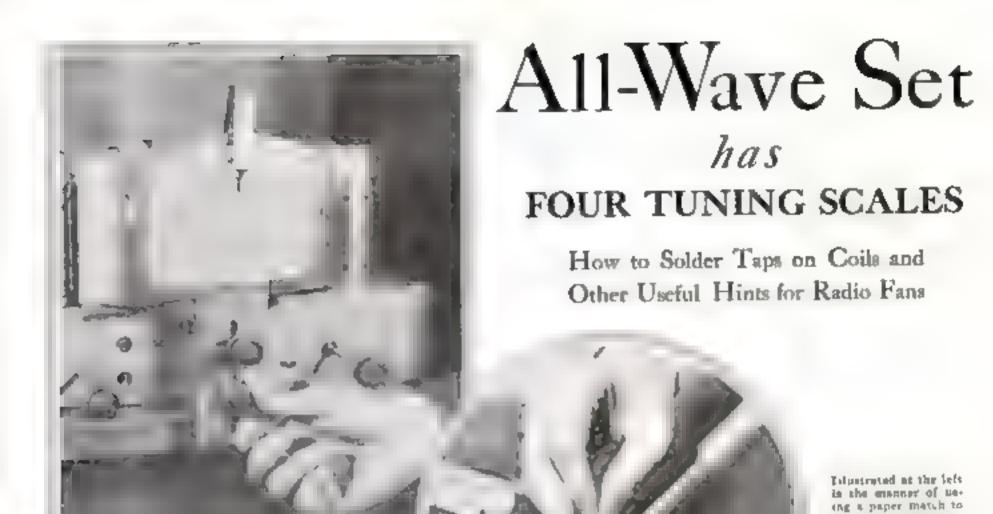
As in the battery, an electric current flows from the positive tarnished silver to the negative aluminum pan and in so doing removes by a chemical reduction process, the tarnish, which is silver sulphide.

Of course, if the same pan is used repeatedly for this purpose, it will become worthless. For this reason, it is better to use an enameled pan and place a plate of aluminum in the bottom under the silver When the plate becomes black, it can be replaced with another. Zinc also can be used if desired

Amazing New Uses Found for Wood



TERE, as suggested by our artist, are unexpected new uses to which the hy-products of American timber are now being put. The waste from logging camp and sawmill—in some regions more than half of the wood actually cut----s reclaimed by the magic of chemistry and goes into the manufacture of hundreds of useful articles.



Photograph shows the control that operates the all wave tage, werene tall and a no raises and lowers the toning that an that the correct sea appears in the feest pagel window

on the front panel of the all-wave receiver pactured above, the set can be changed over quickly for operation on any wave band from 15 to 550 meters. The same twist of the knob a so shifts a movable tuning dial so that the proper scale appears in the dial window of the receiver

As shown in the photograph, the four tuning scales, one for the broadcast band and three for the short wave bor is, are located one below the other on a suming frame that is moved up or down by operating the change-over sweets.

For instance, if it is desired to operate the receiver between 80 and 185 meters, the switch knob is turned until the lighted tuning dial for that range appears. The receiver is then ready for operation.

Above the four scales is the printed word "phonograph." When the control switch is turned to its extreme position so that this word appears in the dial window, the receiver is connected for use with a phonograph pick-up attachment. This dial makes the all-wave receiver

This dial makes the all-wave receiver four sets in one, since only the tuning scale corresponding to the position of the change-over switch appears in the dial window. The shifting scale is made of a translucent material and is lighted from behind by a small bulb

HANDY RADIO TOOL

GRIPPING auts, screws, or loose weres in the congested depths of a radio cubinet offers a real problem to one's ingenuity. With the novel tool illustrated, however, it becomes a simple matter. A push of the convenient plunger and four spring-operated fingers reach out and grasp the desired part in any position allowing it to be put in place, tightened, loosened, or removed. Being long and slim, it will

When the prunger is pushed down, the loar fingent on this root open to pick up small parts or hold note and acrews as above to photo above

TOOL HAS STEEL PINGERS

reach parts situated in a mase of wires and it is especially scated for retrieving the small note and screws that persust in dropping down inside the chasses where your hands can't reach them.

NAILS AS DRILLS

By SELECTING an assortment of shingle nails of various sizes and removing their heads with a saw, the radio fan who constructs his own sets can provide bimself with inexpensive substitutes for the frail drills he ordinarily uses for drilling small holes in thin panels and conforms. The sharp points of the nails will cut almost as fast as a drill

CAR SET KEEPS RUNNING

OWNERS of automobile radios may find that their receivers continue to operate for a fraction of a minute after the swatch is turned to the off position.

raise the wild on a cool when suddering a tap in this way the insulation is the

tested from being

charred with the Irda

This is due to the fact that the cathodes of the tubes cool off slowly and being hot, continue to emit electrons. Since the B battery is always in the circuit, the tubes operate until the cathodes cool.

Most automobile receivers are inclosed in a metal box and placed directly in back of the motor under the dashboard. This probably causes the cathodes to retain their heat longer that they would under ordinary conditions.

SOLDERING KINK

WHEN soldering taps on coils, care should be taken not to char the insulation on adjacent turns. Burning the silk or cotton covering transforms it into carbon, which is a conductor and may cause a partial short circuit. The best way to make such a connection is to lift the wire to be tapped and slip a piece of paper or a match under it where the joint is to be made. This will protect the adjacent insulation and furnish a convenient raised surface for soldering.

The receiver transformer, which can be used to keep nowanted names from reaching the speaker, should be placed as shown at the right, close to the antenna and ground connect one at the sat. Below, cho-hacting by-pass condenses to elements. "
terforence coming from spacking brushes



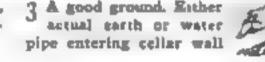


Keeping Your RADIO

FOUR POINTERS ON NOISELESS RECEPTION .



1 High outside antenna, rigged in a straight horizontal line





2 Perfectly shielded receiver and carefully deeigned power supply

A low-loss, interference-free lead-in from



Man-Made Static Can Be Shut Out of Your Set by the Use of a Condenser Across Sparking Contacts and Choke Coils on Motor

OISELESS reception, free from the garbling crashes and crackles of static, has long been the goal of radio engineers.

I infortunately, natural static is a weird product of the atmosphere and askle from increasing the strength of broadcasting noway has been found to chiminate it. However, tests have shown that atmospheric static constitutes less than twenty percent of the total interference to broadcast reception.

The sparking brushes of a motor, the vibrator of a violet-my machine or battery charger, and defective beating devices all contribute to the noises that hamper clear reception. Even the titry sparks from the commutator of a small fan motor can set up a racket in a nearby radio that sounds like bricks tumbing down a metal chute.

These are all sources of artificial static and being man-made they can be controlled. Man-made static, it has been found, is caused by the making and breaking of an electric current—a spark. Obviously, one way to eliminate it is to remove its effect, and this can be done in

most cases by connecting a by-pass condenser or other filter arrangement across the sporking contacts

The function of the condenser is to provide an easy path for the high frequency currents and prevent them from being radiated to the receiver. The size of the condenser depends, of course, on the seventy of the spark.

A violet-ray machine, for instance, generally can be salenced by connecting a one or two microfarad condenser across the butter contacts. The condenser should be rated at a working voltage equal to about twice the voltage of the circuit.

If the vibrating arm is hard to teach, the condenser can be connected across the two supply wires leading from the plug at a point where they enter the case of the machine. To be effective, the condenser should always be connected as close to the source of the trouble as possible.

A one-quarter microfarad coodenser connected across the brushes of the small motors used to fans, soda mixers, hair dryers, and similar devices using universal or D. C. motors will eliminate the inter-

ference that in caused by sparking brushes.

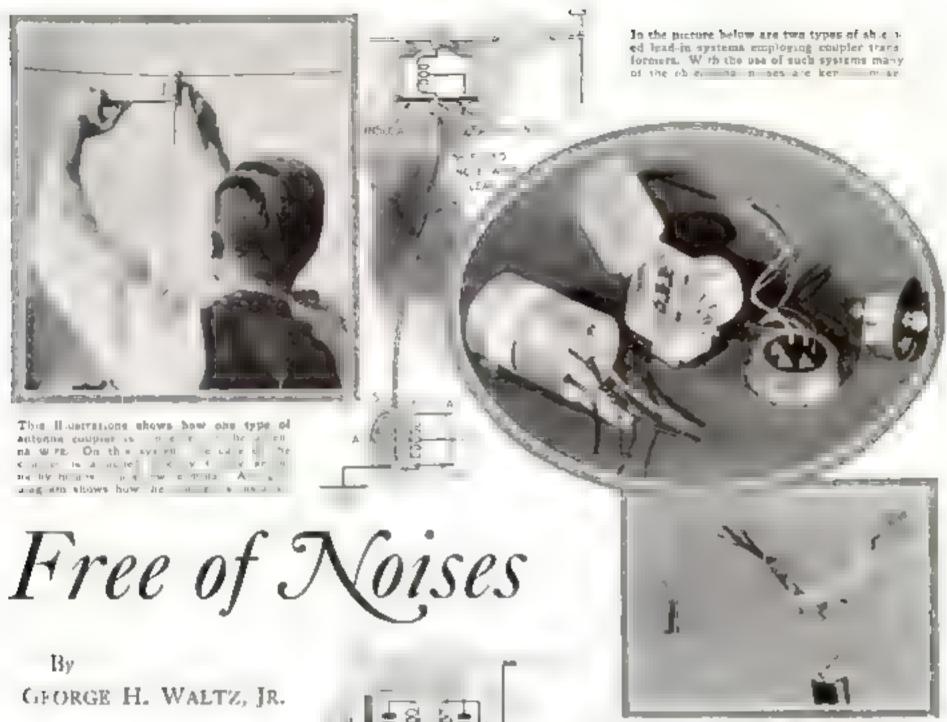
In obstinate cases, a combination of condensers and choke couls connected to the motor will often succeed where condensers alone fail. The choke couls act as impedances to the radio frequency currents while the condensers by-pass them to the ground.

Interference from the contactors in elevator circuits can be eliminated by connecting large condensers across the contact terminals. In such cases, large condensers of at least twenty nucrofarads capacity should be used

Since any inechanism in which a circuit is made and broken is a possible source of radio interference, the hunt to find the trouble and eliminate it sometimes becomes complicated. For this reason, attempts to eliminate interference by the falter method are ulten unsuccessful and

The sparking wheel on a trolley car pole can set up interference that will rum reception over a large area, Here is a

source of trouble outside the jurisdiction of the radio owner



Of course, If you live in a private riwelling located some distance from troley and power lines you can control the interference-making devices near your

received

Fortunately, radio fans, especially those living to conjested districts, can eliminate interference in still another and easier way Unwanted noises enter the receiver by three router-through the antenna and ground system, through the receiver, and through the power lines supplying the set Obviously, by careful designing and instaliation all three of these back entrances can be successfully blocked.

First, a radio receiver should be adequately shielded. Parts and wiring must he protected and the power supply circutts must be designed to exclude inter-

ference.

To test your receiver for perfect shieldfng, first disconnect the antenna lead and ground wire from the set. Then connect the antenna and ground binding posts together with a short piece of wire and turn the volume control to its full on position. If no signal is beard, excepting perhaps the faint response from a highpowered station that is located nearby it shows that the receiver is about as well shielded as possible

It is in the rigging of the antenna where the amateur can do the most to eliminate interference in factory engineered and constructed sets. For broadcast purposes, a single, horizontal wire about one hundred feet in length forms the best type

RECEIVER of antenna. The lead-in can be connected at either end or in the middle, whichever

is most convenient Always ayund gaggagging an artenna. It will reduce rather than increase the signal even though more wire may be used by so doing. If you can't rig a one hundred foot antenna in a straight, horizontal line,

use a shorter length.

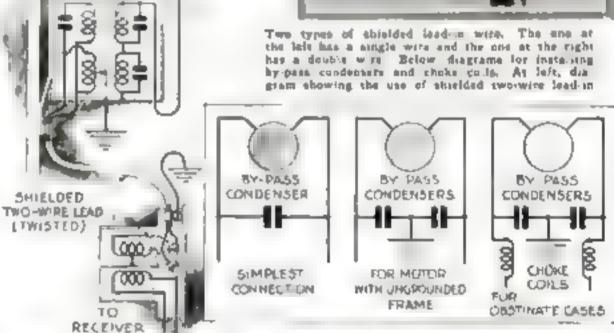
Rig the antenna wire as high as you can get it and keep it away from the house if possible. Under no conditions, place it within ten or twelve feet of metal rooting and avoid running it adjacent to roof houses or similar projections that may contain some form of electrical equip-

When an antenna is rigged in a back yard, it should run two or three feet above

the trees, If power or telephone lines are located close-by, arrange the antenna so that it will be at right angles to these. Remember interference that reaches the antenna can not be eliminated, so it is best to plan your work with care and rudgment.

As a lead-in approaches your house, it eets closer and closer to a field of in erference. Every home, and especially apartment buildings, contains appliances and equipment that are bound to radiate unwanted noises. To exceede these a shielded lead-in wire can be used.

Shielded lead-in wire, in most cases, consists of an insulated cable covered with a copper braid or lead sheathing. The shielding is grounded and thus serves to lead off the (Continued on page 99)



Don't Starve Your Car's Battery

Gus Wilson Describes Easy Way to Test Ignition System and Keep It in Good Shape

By MARTIN BUNN

ABBIT-LIKE, the Commings' car bounded over the bumpy railroad crossing. Then-blump! A hollow thad resounded above the mitles. Harry Cummings jammed on his brakes. His wife shricked.

"What have you done now?" she demanded.

"Aw, say!" protested Harry, "What's the idea of blaming me for everything? Can I help it if we hit a loose stone and it bounces up against the floor hoards?"

"Well, you could be more careful," shapped Mrs. Cummings, She smiled once or twice, "Say what you like," she insisted, "you did do something to this car' Can't you smell it burning?"

"Gosh I guess you re right!" exclaimed Harry, He steered the car over to the side of the road and stopped, "Smells like hottery acid to me," he mattered after a moment, Quickly he lifted the front seat and raised the cover to the storage battery compartment.

Some minutes later, Gus Welson and Jue Clark, the owners of the Model Garage, were listening to Harry Cummings' strange tale of woe

"Look at that, will you," Harry directed, pointing down at his uncovered battery. The compound on top of that left cell is split right across the middle where the fider cap goes. When I first looked at it, the filter cap had entirely disappeared and the top of the cell was bulged up like a broken stick where that crack is.

"I hunted around and finally located the missing cap at the bottom of the battery compartment. I pushed the top of the cell back in place, acrewed in the filler cap, and then drove here."

Gus Wilson leaned over to inspect the battery, Joe Clark peering inquisitively over his shoulder, while Mrs. Cumnungs I deeted impatiently in the back seat.

"Joe, suppose you take my car and drive Mrs. Cummings home." Gus suggested after glancing at the back seat and recognizing the warnings of an impending verbal

Lost A Bigort Ciscuit

Say what you like, Mrs. Commings rank to the continuation of th

storm. "There's no need for you to wait around until we've found the trouble, Mrs. Cummings."

When they were gone, Gus busted himself with the leads from the battery. The battery compartment was tretal and the heavy cables that led from the battery passed through holes in the metal sides.

As Gas pulsed and pegled the cable leading to the starting motor, long yellow sparks mesagged in all directions.

"Here's your trouble," Gus announced triumphantly, "The insulation on this cable has worn through right where it leaves the battery compartment. Every time you went over a bump, the base wire came in contact with the metal aides of

the compartment and caused a short cir-

"That's a short circuit all right," Cummings agreed, "and a bad one too. But what spit the top of the battery open?"

Gus scratched his head, "Well, you can bet your hat the short circuit had something to do with it," he decided at hist. "My guess is that you've been doing a lot of daytime driving. That charged up your lattery and it began to gas. By that I mean that it bubbled off hydrogen gas.

"Hydrogen is an explosive gas when it s mixed with air and your battery compartment, being closed over, confined the gas that was given off. When you went over those bumps at the railroad crossing, the bare wire on that worn battery lead came in contact with the metal sides of the compartment and caused a short circuit

"The sparks from the abort ignited the gas maxture and blew the top off that leftband cell. The thud you heard was the rubber filler cap hitting the cover on the bettery compartment. You should inspect your battery leads now and then," he finished.

"Isn't there some way you can reduce the charging rate of the generator when you're going on (Continued on page 100)

GUS SAYS: It's a good plan to try out all the tools you carry in your repair kit to make sure they fit. You may be toting a lot of uncless weight. It's heartbreaking to get a flat tire miles from nowhere and find that the trick jack you bought several years ago won't fit under your new ear.

BETTER SHOP METHODS : IDEAS FOR THE HANDY MAN : BLUEPRINTS



MODEL MAKING : HOME WORKSHOP CHEMISTRY: THE SHIPSHAPE HOME

NEW CONTEST

Covelty Jig-Sawing

• WHAT CAN YOU MAKE WITH Picture Puzzle Tools?



Scridind book encloses associate for craftemon who delight in making novals an

zies have made the ig saw almost to fam aar a tool as a hammer or a wreach, thousands of adept amateur jures wers are asking themselves "What eise can I make be-

That is a good question. The fig saw is really a most versa ile little tool and it can perform wanders when skinfully used. If you doubt that just look at the gracefully scroled book and illustrated above. This was made by Edwin M. Love and it, of cause, an exceptional piece of work, but anyone who is also to cut out a workmanlike picture pussle can duplicate it easily enough.

To encourage a friendly competition among readers as to who can work out the best novelties with a jig saw, Popular Science Monthly offers the following prizes.

the recienting	for your a.	-	
First Prise			25
			15
Third Prize			5
Five Prizes \$1	each		5
Total		4	0.5

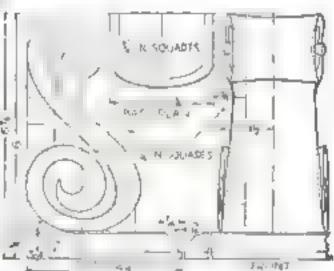
All you need do to enter this contest is to make some jig-saw project that is



Above J.g tawing over o the
sections. Which
are lawe gued
together ar
shown in the
oval Al right
A trip of wood
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if a guide for
phaping the base



novel in design but not too large or computated, and take at least two clear photographs of it. Send the prints, together with a brief description and, if necessary, a small explanatory drawing, to the Jig-Saw Contest Editor, Popular Science Monthly 381 Fourth Avenue, New York N Y, before April 3, 1933.

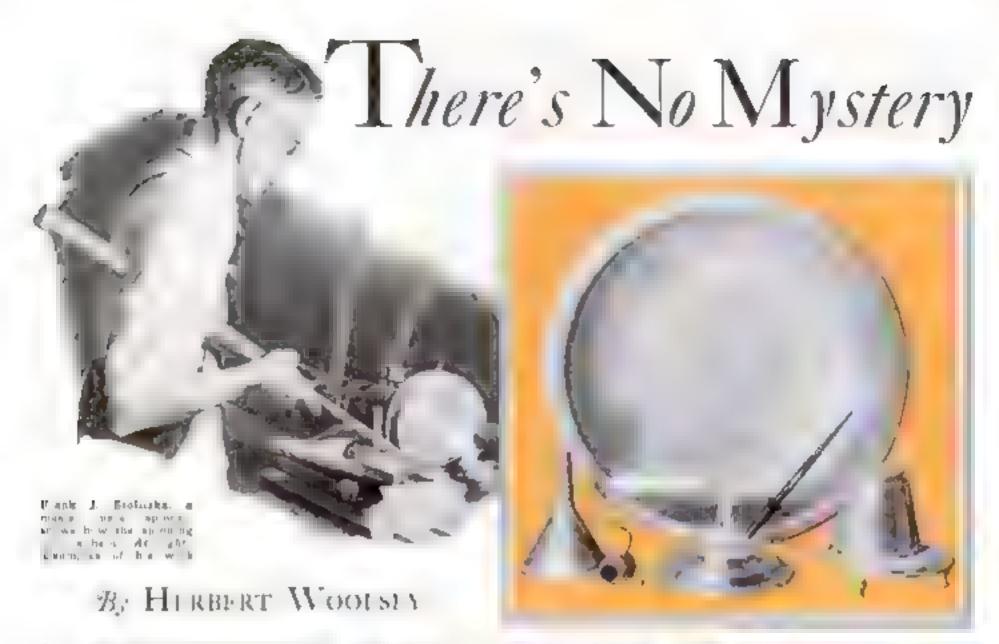


A glued-up scroll. Much of the emoothing can

done on a sand up drum, if one is at bend

The drawings. To add weight, if desired hotlow the base and fill with molted paraffin and abot.

You may use any materials you please and other tools beside a saw; however, the principal tool must be what is variously called a fret, scroll, or coping saw, or a power jig or scroll saw. The entries will be judged mainly on their novelty, but the craftsmanship and simplicity will also be considered. Old-fashioned, intricate fretwork is not desired so much as new ideas for utilizing a jig saw. In the case of ties, each tying contestant will be awarded the prize tied for



a great many professionals as well, the spinning of metal is a mysterious process in which the spinner converts flat pieces of sheet metal into all kinds of intricate shapes. There need be no mystery about spinning for it is a field which hes within the reach of any mechanic if he has access to a untable lathe.

If you are not sure just what spinning in, look about you for some examples Perhaps the coffee percolator on your kitchen stove was made on a lathe. The size and cake pans may claim the same origin, although it is equally likely that they were stamped out on a press. Parts of light fixtures, metal water and cream pitchers which have bulging sides, automobile headlight casings and reflectors one-piece aluminum funnels—all such objects can be produced by the metal spinner

Professional spinners use a lathe that is built specially for the work. It differs from other lather principally in the bearings in which the spindle rotates, These are beavy and built to take end thrusts. Frank J. Stoutzka, of Akron, Ohio, a master spinner of more than forty years' experience, uses & homemade lathe made by installing, on an old machine lathe hed, a set of heavy roller bearings packed in grease. There are two rings of rollers in each bearing. The nose of the spindle is threaded like that on any engine lather The ta stock is of conventional construction, but has a special center. The tool rest also is designed for spanning requirements. This lathe is the one teen in nearly all the photography illustrating this article.

You can spin on any ordinary metal turning lathe, but you will have to be careful. The high speed of the spindle—

trom about 800 to 1,200 n.p.m. for some work—combined with the beavy pressure of the tool, may cause bearing trouble. Perhaps by installing a roder or ball thrust bearing, against which an intermediate chuck presses, you can relieve the strain on the main bearings to some extent,

Many wood turning lather are more adaptable to spinning than machine lather. For example, one type has a four-step V-belt pulley rotating against a ball thrust bearing. Such a lathe, with a good supply of power and a few minor changes that it no way affect its inefulness for woodworking makes at racel ent small spinning makes at racel ent small spinning makes.

The spinner's tool rest Inoks like an un-

usually heavy T-rest of the type familiar to woodworkers. Along its top surface is a row of holes into which a steel peg measuring about ½ in, in dameter, can be inserted. This peg is a little larger than the holes, and has one end turned smaller to form a shoulder that prevents it from dropping down too far. In use, the peg forms a fulcrum or rest against which the tool bears, enabling the operator to apply great pressure against the work.

It is absolutely necessary, for successful spinning, to have a rotating tailstock or back center. There are on the market various types which, in general consist of a bollow steel cylinder to which a sizel shaft rotates against radial and thrust



Fig. 4 at 4 at a factor of a property of the heavy by bearings

About Metal Spinning

If you have a lathe, you can learn the art easily and make many decorative objects from sheet copper, aluminum, and other metals

ball bearings. The outer end of the cotating shaft is turned to an angle of about 60 deg., and the end of the cusing opposite the point is equipped with a inper shank that fits the lathe tailstock, However, the wood lathe previously mentioned, which is shown below, was filted out with a rotating center simply by alipping a small had thrust hearing over the 3/2-in, tailstock shaft, removing the set screw from the tailstock center supplied with the lathe. and placing this center over the shaft so that its end rests against the bearing. The cost of the bearing was 25 cents, As for the tool rest, it was made by fastening a steel bar to the end of a short section of 16-in, shafting and druling a row of holes for the peg-

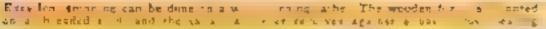
In the stamping of objects on a press, hardened steel dies are used. Lakewise, in spinning, steel or wood forms are employed. But the cost of such forms, which need not be hardened. In but a fraction of the cost of corresponding dies, which makes spinning frequently preferable to stamping particularly where small rots are being made. And, of course, many things can be made by spinning that could not be produced on a press.

The spinning form, chuck, former, or whatever you prefer to call it, is attached to the rotating lathe spindle Next to it is placed the metal blank to be spin; then a metal or wood button or adapter (Continued on page 88)



Above Applying lard to a disk with a coth douber. The titre of susceptions at the right show first the use of a point being at one hide second, ruling an edge with a roof made from a grooved pulley wheel third, another wherled tool for making grooves.









MAKING AN ALARM CLOCK SHUT ITSELF OFF

If an alarm clock is placed within reach, it startles as and gives us a more or less severe psychological shock when it goes off yet if it is too far away from the bed we have to get up to turn it off. Here is a simple method of overcoming this problem, provided one is in the habit of awaking at the first ring and will not merely turn over and go to sleep spain.

A metal clip is made to slip over the winding handle of the alarm in such a way that it will come to a stop against the hand-set knob or the alarm-set knob when the alarm handle turns while the alarm is ringing. The alarm handle then has to be wound only half a turn to set the alarm, and it is never necessary to turn off the alarm with the regular lever. This improvement was made in the case of the clock illustrated above merely by placing one of the new flat hairping on the alarm handle.—Altrox Birkers

RUBBER GRIPS IMPROVE DRAFTING TOOLS

The handles or finger grips of many small drafting instruments are thresome to use, especially on long, tedious jobs. An improvement is to slip short lengths of pneumatic windshield wiper tubing over the finger grips. The inside of the tubing is the right size for most small instruments, and the outside, being soft and finely ribbed, gives an ideal grip.—F.B.

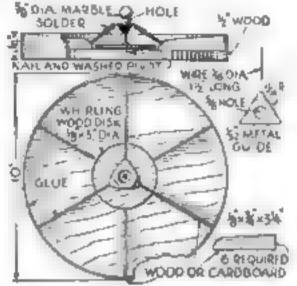


It is easier to hold amail drafting tools if rubber tabing is supped over the handles

BECAUSE of the present popularity of marble games, many home workers are looking for new and simple variations of standard designs that can be constructed easily and inexpensively. A design of this type—a little game called "disk-o-luck"—

WHIRLING DISK MARBLE GAME

easily and inexpensively. A design of this type—a little game called "disk-o-luck"—is suggested in the accompanying drawings, which give all the necessary information as to its construction. The board should be attractively painted in bright colors, preferably enamel or lacquer



A top view and a side or edge view, partly broken gway to show the disk and guide plate



To play the game, the disk is spun with one finger and the marble is dropped through the bole in the guide plate. The whirling action of the disk rolls the marble into one of the pockets. The goal is a score of 200. Any number of players can join in the game.—Donald W. Clark.

TRUPICAL toy fish are even more

beautiful under artificial light than

in daylight. The flood light shown

is small enough not to interfere

with the vision, simple and inex-

pensive to make, and, most im-

portant of all, may be attached

wherever necessary. It may even

be applied to the cover glass of round, bowl-shaped, and globe

Type aquaritims. A newing muchine light and socket are perfectly

adapted for the average home

aquarium. For sarge aquar ams, tu iular display lampa (with in-

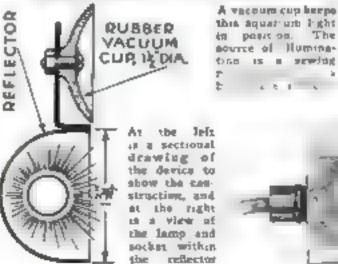
termediate base), either single or

in multiple, will give any effect

desired. Sufficient extra vacuum

HOW TO FLOOD-LIGHT YOUR AQUARIUM





cups should be udded, of course, to sustain the weight.

The reflector of the lamp illustrated is made of the and is 5 in long and approximately 134 in in diameter. The rubber vacuum cups, with a small bolt and but attached, may be obtained from dealers in rubber goods. By means of bronze powder and a few drops of bronze powder

be finished to harmonise with any aquarium.—R. Genald Bullard.

Working Toy Derrick Built for Few Cents from Odds and Ends

Because it really works, the derrick illustrated is a completely satisfying toy for any small boy. It is large and substantial, yet the construction is sample and the materials, for the most part, are odds and ends of wood, were, and that can be packed up in any home workshop.

The base should be about 12 by 28 in., made from 1/4-in. boards cleated together. Fit casters in the four corners, or use small wheels from discarded toys. A turntable about 14 in. in diameter is mounted at one end of the base with a bolt. In the original model this turntable was made from the top of an old

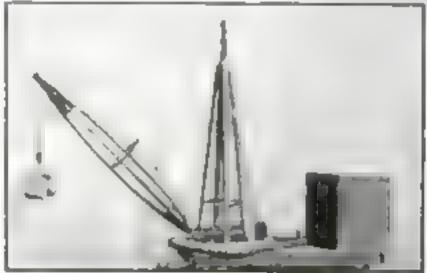
flower stand. If nothing like that is available, saw the disk from a wide board.

On the baseboard about 6 in back from the edge of turn-table fasten a small spool which has been wound with tape and fitted with a handle. A belt extends around turntable and spool; it can be made from a couple of old fan belts or from heavy canvas

Next, the tower is built on the turntable. Almost any kind of wood may be used. The parts are so well braced that soft wood will serve the purpose adequately and it has the advantage of being easier to work with

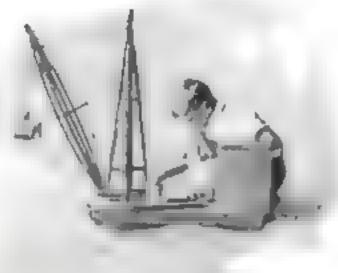
than hard wood. The aprights are a by \$\frac{1}{2}\$ by \$25 in and are screwed to cleats at the bottom. The top section, \$\frac{1}{2}\$ by \$10 in., is slotted to receive two sheaves or pulsey wheels. Wedge-shaped pieces are fitted on the four index, and to these pieces the uprights are screwed as shown at \$\frac{1}{2}\$ in the drawings at the bottom of the third column. Braces are fitted between the uprights as indicated in the photographs.

In building the boom, which is shown at B, make the end sections first. These are 34 by 34 by 7 in. with wedge-shaped pieces fastened to them to receive the ends of the ribs. Cut a slot in the upper end section and fit in a small public wheel. The ribs a section and at sections, and at



the center insert a spreader made of 3/2in wood 2 in square, with the corners cut off as in detail C

To give wider beating for the boom at the bottom it is best to screw to each side rib a piece of wood ½ by ½ by 12 in., heveled off to fit the angle of the rib, as shown in the drawings. These two arms and the end of the boom itself should be drilled to receive a stiff piece of wire. Screw two blocks to the turn-



With this toy derrich a boy can go through all the motions of a sig-tionary ongineer. Operating one which I its the boom, turning abother raises the burker and moving a speed makes the turniable revolve.

table at the base of the tower to carry the ends of this wire, forming the bearing for the boom. Brace the boom with wire to give greater rigidity

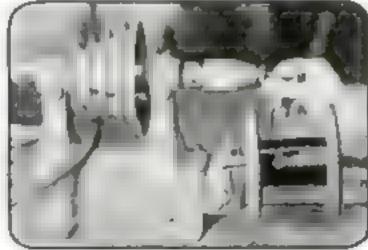
Make the bucket from two pieces of heavy tin rut out and bent as at D. Put them together with piece of stiff wire.

Lifting the boom and the bucket is done by two small windlasses made of heavy tin or other sheet metal and heavy wire, as shown at E. The shaft or crank should fit loosely enough to slide sideways and engage the stop.

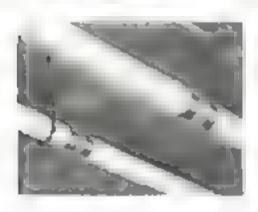
In the original model the bucket was interchangeable with an electromagnet, power for which was supplied from an old automobile battery incased in a box behind the derrick.—P. J. Sierke.

WINDING SMALL COILS ON A LATHE

IN WINDING coils, magnet bobbins, or small pringtures on the lathe, the spool of wire can be conveniently beld by mounting it on an Lshaped rod set in the tool post as illustrated at the right. The bobbin then can be gripped in the lathe drill chuck and rotated either by band or with the motor drive. whichever is the more convenient and practical for the special work in hand - R. W.

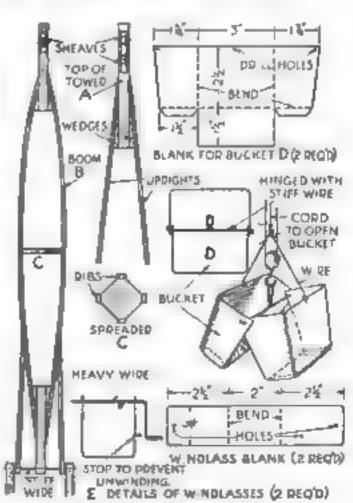


The spoul is placed on an L-shaped and set in the tool post, and the hobbin is gripped in a drill chuck



INSULATED PIPE JOINTS

The cans can be used to repair sections of asbestos pipe covering which are coming aport. Both the tops and the bottoms are temoved and a length-wise cut is made from top to bottom. Thus prepared, the cans are placed over the asbestos covering where the joints have separated, and regular pipe covering bands clamp them on.—\, Esper.



Suggestions for making the boom, tower backet, and windsteen, and patterns for cutting the tim parts

Knotted Silk Pulls for

An a namental and disease paul for a floor amp made by know and sugar the causing his of heavy at a cable of so. The knote are of the name type as the accused for trong packages. As eight A larger view of the complete pure and to taken?

By Kenneth Murray

RNAMENTAL square-knot pulls for wandow shades or floor lamps can be made in a variety of designs from medium or heavy silk cable cord. The length, size, color, and quality of cord can be chosen to suft individual preference

This project is similar in character to the



The filter south are held taut by catching them on a ware high lastened at one a chest or we at



1 The filter cords are doubled and placed over a nati. and the other ends are tied to the knotters book. The knottens cord is then tied around several inches below the mail

2 After the arranght square knot section has been carried to sufficient sength, a ser to of half bucken are tied and the null naturally assumes a twisted or spiral shape

3 Another square-knot section is added; then the cords are knotted together to make a hard hall. The forces the base for the tasset, which is added separately

Window Shades and Floor Lamps

knotted belt described in a previous article (P.S.M., Nov. '32 p. 77) and is presented in response to hundreds of requests from

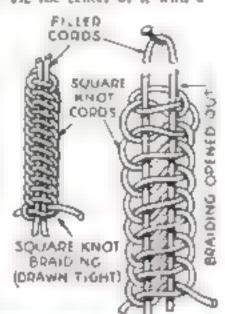
renders for more designs for square-knot work.

The only equipment required is a hook to hold the loose ends of the cords while the knotting is in progress. This can be a heavy wire book (or bent nail) set into a piece of wood about ½ by 1 by 3 ½ in., as shown in one of the photographs, or a small notched stick of wood such as was illustrated in the previous article. In in her case it is fastened to your chest.

For the filler use two lengths of cord, each 2 yd, or more in length. Double these and hang them over a nail as shown. Make the ends fast to the hook on your chest so that the cords will be held taut as shown in the circle on the opposite page

The knotting cord is 3 yd. long. The the center of it with a square knot to the filler cords several inches down from the nail. Then, to make a pull exactly like the one illustrated in the photographs, continue with nine more square knots. Next run a series of about there-five half hitches to give a spiral design. Add ten more complete square knots, and finally knot all the cords into a small bal.

To make the tassel, cut twenty-five or thirty pieces of cord 6 in long, group them about the ball and the another cord securely about the end of the pull, above the ball Draw the tassel cords down over the ball and the them immediately beneath with several turns of the same cord. Trim the ends evenly





The diagrams in the left hand column above show the actual steps in Tying the first knot around the filter curds. For clearness, only one filter cord has been induced. The other cultury shows how second had of knot is used. At left. A series of knots



4 The tassel is made of twenty-five or thirty pieces of cord 6 in long. The quickest way to cut these is by wrapping the cord around a piece of cardboard 3 in wide

5 The first operation in making the tassel is to group the cords about the half and extending along the pull. Another nord in they used to fastion them just above the half.

6 The transel cords which extend slong the poil are near turned down over the ball, and a 1 the cords are used beneath the ball with a few turns. Then the ends are trimmed

"WATER" IN SHIP MODEL CASE LOWERS TO REVEAL HULL





Prize winning model of the clipper ship Sovereign of the Seas mounted so that the whole of the heautifully modeled built can be seen. Below. The case with "water" reused to the water Lon-



In General appearance the ship model case illustrated is not unlike others, but by turning a knob "water" rises around the hull until the ship seems to float at anchor. This effect is achseved by raising a light wooden platform, with a hule in it the shape of the model's water line. The hole is undercut to aid in centering the platform in its lower position, where it rests flush with the stationary mounting that supports the model.

Make the impation water by soaking linen in thin glue and modeling it in place while still wet. Color it with water to or paints and touch up the wave crests with white ename. She lat the interior of the platform to prevent warping

The device that elevates the platform

rere re. and these move up and down a light pietform upon which the abitation water to destand consists of two sets of woodpieces with curved outlines—

Turn og the central

of wooden came to

consists of two sets of wooden cams pieces with curved outlines—set near the end of the platform. To reduce friction, the edges of the cams are V-shaped and slide on strips of tin on the underside of the platform. The cams are operated from the center shaft with the hand knob by means of heavy cords tubbed in resu-Each cord runs continuously from one shaft to the next, making about four turns around each. The end shafts should be about twice as large in diameter as the center shaft

All the materials may be purchased for not more than five dollars, and the resulting case is exceptionally effective. The model in the case illustrated is the chipper ship Sovereign of the Seas. It won first prise at a recent exhibition in Detroit—John A. Williams.

BRASS CHAINS MODERNIZE OLD MIRROR

I on an expenditure of not more than 40 cents it is possible to make a good-looking modern instruct frame from an old one taken from a mantelpiece, buffet, or other piece of furniture that has been discarded entirely or cut down and modernized without using the bid mirror as is now so often done. Small brass chain and picture wire, which can be bought at any hardware store, are the only materials necessary

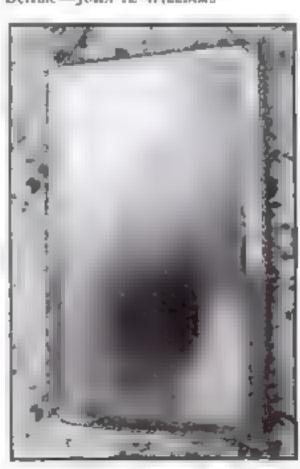
If the edge of the mirror is rough, it is best to have the chain extend all around as shown in the accompany ing illustrations. Four short pieces of chain are attached at the corners by opening the end links of each piece, hooking them into links of the main chain, and closing them again. Another length of chain is added at the top for hanging the mirror. The corner loops are held in place over the glass with picture were which extends from corner to corner across the back as shown.

In some cases the edges of the mirror may have been ground true and smooth and therefore do not need to

be hidden by running the chain all around. It is then sufficient to use four loops of chain at the corners fastening them behind with picture wire as shown.—Henry C. Engel.

Modernised morzor and diagram showing strangement of the ne and wire at back





POPULAR SCIENCE MONTHLY



HOW TO HOLD VERY THIN STRIPS FOR PLANING

Very thin strips of wood are often required, especially for building models, but it is difficult to had them so they can be planed without breaking. Receastly I needed some strips less than 1/16 in, this k I first dressed a block stiff enough so that it would not bend under the plane and then gued about I in, of one end of the strip to it with thin paper between, and with the grain running the right way from the gland end. The planing was done away from this end.—John Treweek

GAGE AIDS IN SETTING CIRCULAR SAWS

This gage for testing and adjusting the set of the teeth of small circular saws can be made in five minutes. All that is preded is a block of hardwood about la in. thick, 14 in wide at the center, and 21/2 in. long, and also four small flathead screws 1/2 or 1/6 in long. One face of the block is kept flat, but the other side is tapered toward both ends, and for convenience the brock is formed roughly to the shape shown en the small photograph at the right The two screws at the center and the lower screw in the photograph just mentioned are adjusted so all have a true bearing surface on the face of the saw. The remaining screw at the upper point is screwed in an

amount equal to the desired "set" of the saw teeth. The more set, the farther in this screw is driven, and vice versa. It can be adjusted very accurately



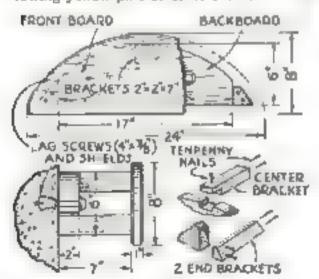
By himself regage against the almas a veral year of related to the early and the detection

In use, the gage is held against the saw at diestrated in the large photograph. It is obvious that the point of each tooth must be swaged or set sufficiently to come flush against the head of the screw that is used as the setting gage—the screw previously adjusted.—A. L. Jackson

BASEMENT RACK FOR GARDEN HOSE

The hose rack illustrated not only provides a safe storage place for the garden hose during cold weather, but also allows it to be used instantly, if necessary, for extinguishing a fire, for washing the basement floor, for filling movable tuba, or for any other purpose. A hose kept on such a rack will last for years longer than if it is carelessly handled and left lying in a kinked toil when not in use

In most small houses the water paper are accessible, and it is a simple matter to remove an elbow in a convenient place and listert a pipe tee and a short length of pipe with a sill cock or faucet to which the hose can be permanently connected when it is stored on the rack. The amount of pipe needed will depend on your plumbing layout, but for the rack itself the following yellow pine or other common wood.



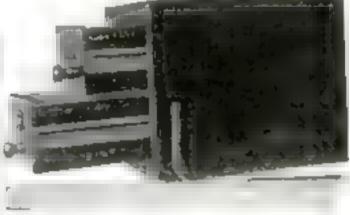
Front and end views of the bose rack and shetches showing bow the brackets are called



Rept on this rach, the hom it always ready for instant use in an emergency

is sufficient: I piece 2 by 6 by 17 in. for the backboard, 1 piece 1 by 8 by 74 in. for the front piece, and 3 pieces 2 by 2 by 7 in. for the end and center brackets. Tenpensy nails are used for fastening the parts together

The rack can be held against the wall with 4 by 36 in lag screws having expansion shields for use in masonry, or it can be fastened on 1 by 2 in strips, which, in turn, are nailed to the floor joists above. It also might be bolted or nailed to the coal bin. The rack illustrated holds 75 ft. of hose.—Withhalt T Weld



DRAWER SLIDES MADE FROM CURTAIN RODS

FLAT curtain rods of the extension type make excellent drawer slides for light drawers. They are easy to install and never bind. Dampness does not affect them, which makes them ideal for use in a basement workshop.

Rods of this type consist of two parts. The targer or outside rod is bolted or screwed with its flat side to the drawer. The smaller or inside rod is fastened on the sides of the cabinet with its flat side to the cabinet. On some rods it will be necessary to put a thin washer between the rod and the cabinet to prevent the rod from binding. This idea has many applications, and it could even be used for small sliding doors.—Daniel Reynolds.

Auto Engine Contest

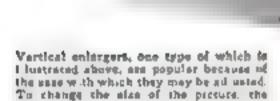
THE prize winners in our contest on the uses of old auto engines will be announced in the April Issue,

MAKING YOUR OWN

Enlargements

A fascinating branch of amateur photography

By Frederick D. Ryder, Jr.



light-tight housing is moved up or down

AKING enlargements is, perhaps, the most fascinating branch of amateur photography. There always is a bit of uncertainty and the chances for a thrill in it. Descate shadings of picture quality, which are buried deep in the imy silver grains of the small negative and pass unnoticed in a little print, show up in striking fashion in the greater area of a large picture.

greater area of a large picture.

Enlarging really is picture taking in reverse. Instead of making a small negative of a big view, you are, in effect, taking a "close-up" of a small negative with a camera lens focused on a large piece of sensitive bromide paper in place of the usual glass plate or film.

The diagram below shows the optical set-up for making entangements. Light from the excert bulbs tikes the diffusing screen and uses its directional quality, it therefore floods the silver grains of the image in the negative with countless rays from many angles. The negative should appear evenly illuminated all





A sheet of ground glass and another of flashed, opal glass held before a fracted electric bulb to show the apparier diffusion given by the opal glass (lower photo)

This diagram explains the simple optical principles that govern all varieties of calaryers Another type of entarging device to which an ordinary comera is examped

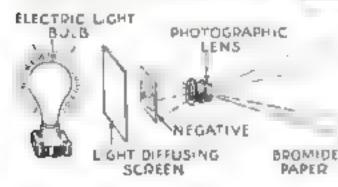
over its surface. This is extremely important for successful work.
You will see what I mean by proper diffusion and even illuminately

proper diffusion and even flumination by studying the two test photographs at the left. These were taken under identical conditions. In each, a sheet of glass 8 by 10 in was held 6 is, in front of a 100-watt, frested electric light bolb. The lower photograph which shows even flumination clear to the edges, was made of a sheet of flashed opal glass. Such glass is translucent but not transparent. In other words, all light rays that reach glass of this type are completely broken up or diffused

The other view is of a sheet of ground glass. Note the poor diffusion. There is a strong bright area opposite the bulb, and the edge areas are dimly lighted. If you were to place a negative in front of the opal glass, it would appear evenly lighted at all points. If placed against the ground glass the lighting would appear decidedly uneven

In home-built enlargers, meyen illumination is a common cause of poor results. If you make your own enlarger, he sure to use flashed opal glass to diffuse the light, and fit the electric light built at least 6 in, back of the glass.

Flashed opal glass can be obtained in all standard plate sizes from any arge photographic supply house. It costs about 50 or 60 cents (Continued on page 90)



EASTMAN NEWS BULLETIN FOR THE

AMATEUR PHOTOGRAPHER

MARCH, 1033, PUBLISHED BY EASTMAN KODAK COMPANY

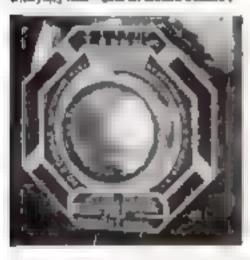


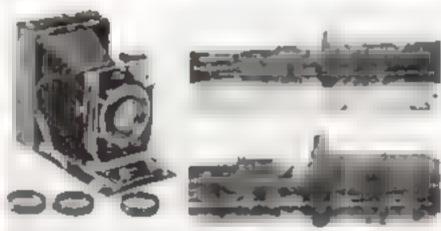
A SEVERÉ MOVIE CAM-ERA TEST, Every Ciné-Kodak Eight must be able to photograph the radial chart shows at the left and produce a movie that shows accurate focus, steady operation, and sharp definition. A test film of each camera is kept on file at the factory. Although this new camera sells for only \$20.50 it is a masterpiece of precise deagn, and takes fine, clear movies—so to 30 scenes on a \$2.25 film. About ten cents a shot.

> ecope Right beautifully made to project clear, steady home moves from the new inexpensive Cone-Kodeh Eight film, only 6 mm. he inch unde Modul 25 shown at right, \$24.50. Other Kodescope Sight Modula, \$44.50 and \$75.

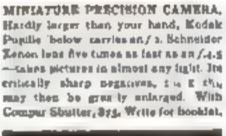


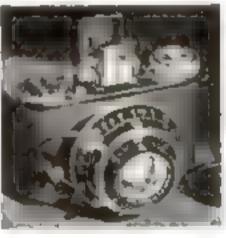
BUILT-IN EXPOSURE OUTDReimplifies the use of the fast fig.; lean shows on the Kodak Six-16 helow. Indicator attached to tria dispirage above correct shutter speed for any stop opening and light -a great convenience. Picture size, 2°, 2°4, price, 85a. Kodak Six-20 (2°, 2°5, 2°4) with fig.; some—full. At Kodak deniers.

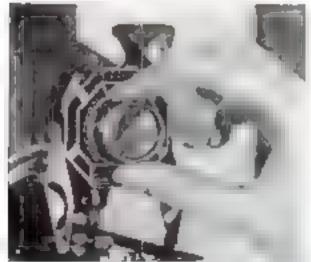




FOUR POCAL LENGTHS FROM ONE RECUEAR LENG. The Rodal Recommendation above uses inexpensive supplementary lenses (\$3.50 pick) with its regular flat lense for repylog, felephoto, and wide angle work, instead of operal lenses couling many times an much. Pictures show enlarging effect of supplementary lens "B" compared to regular tens above. High speed lines and shutter, double believe extension, optional use of plates, film pack, or punchromotic cut film with ground glass focusing are other (natures. Two sixes, 4 g x 3 g at \$40 - 3/2 x 4', at \$48. Bookiet on suquest.







TO GET PICTURES OF CLOUD EXPROTS or unminutely accurate rendering of highly calored landscapes, flowers, art objects, etc.—simply slip a color filter over the two. It costs as little as 75c and often greatly improves picture quality.



WHAT a DIFFERENCE COLOR MARKS. With this Kedak Transparent Oil Color Outst you can give your priots and enlargements the beauty of delicate, rick coloring. Comprehensive instruction book makes their use simple. Complete outst, \$5.75.

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Automatic Mail Bag Pick-Up

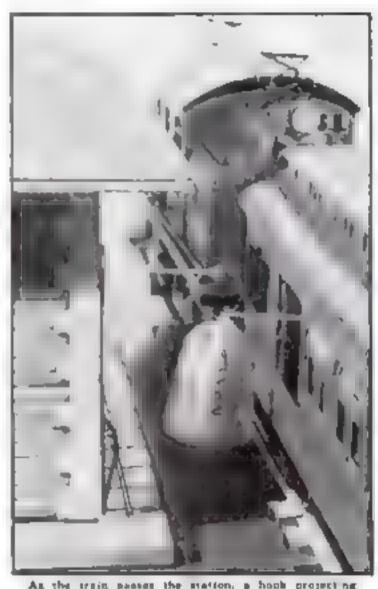
AND OTHER MODEL RAILWAY HINTS

NE of the most interesting and easily made accessories for any model railroad is an automatic mail bag pick-up. On real railroads it is the practice to pick up the man bag from small local stations without stopping the train at all. The bag is suspended from the end of a cross arm on a pole beside the track, and the mail or baggage car is fitted with a booklike arrangement that catches the bag and carries it along with the train as it rushes by

The flustration at the right shows the simplest model of this set-up. The miniature mail bag should be sewed up with a wire ring at the top and then kicked around on the cellar fluor for a while to give it the tharacteristically drab appearance of a real, well-used mail sack.

Fit a wire hook at the side of the station or on a pule near it, with the long point of the hook parallel to the track and pointing in the direction the train is traveling. Next fasten a similar book in the door of the baggage car or other convenient place. Have it point in the same direction and place it so it will pass under the hook at the station

A still more tricky fixing is to arrange the wire on the train in a downward curve so that the mail bag will swing in the door and out of sight. This permits several mail bags to be picked up, one after the other, without stopping the train. This gives a surprisingly realistic effect, as if a mail tlerk were actually inside the car to take the bags.—Carl Rohles.



As the train passes the matten, a heat project agfrom the baggage car automatically picks up the each

Imitating Grass With Sawdust

FROM any woodworking shop you can obtain for the asking all the sawdust you need to make grass and underbrush for the acceptry of your model radway.

Prepare a solution of green household dye, being careful not to get it too strong. A little dye goes a long way Pour the sawdust slowly into it as shown at the right, and after it has soaked up enough color, pour off as much of the solution as you can and spread the sawdust in a thin layer on newspapers to dry. Paint the area with a thin solution of give and sprinkle on a layer of the dyed sawdust. For uniformity, it is best to sift the sawdust through window screening.

Bushes are imitated with him of fuzzy rope bound with wire at one end, then frayed out, dyed, dried, dipped in glue, then in green sawdust. Add dabs of bright lacquer for flowers.—Rossar W. Hype



Longer Curves for "O" Gage Track

TRACK supplied for "standard" gage trains is made with much easier curves than are used for "O" gage track. Therefore, to obtain longer curves on an "O" gage

railroad at some particular point, the supports way is to buy a few pieces of "standard" gage curved track and refit the rails to your "O" gage ties. This is practical because "O" gage and "standard" gage rails are identical in cross section. To release the rails, place the track upside down and hold it firmly while you force a screw driver down past each side of each rail. The "standard" gage rails are fastened in the "O" gage ties by placing a nail set with its point at the center of the lip and giving it a light blow. Simple bending is sufficient to hold the insulated center rail.—With any ATKIN

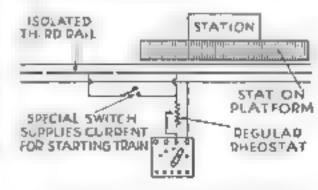


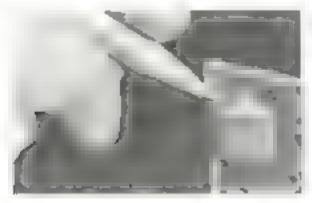
How to open up the lips on the underside of the ties to release the racis

Train Stops But Lights Stay On

ORDINARILY, shutting off the current to stop the train at a station also puts out the aghts in the couches. This somewhat spouls the realism of the effect. I. can be eliminated by wiring the track as shown below. Pick the section of track where the locomotive normally stops and remove the third-raft pins. Supply current to this one section of track through a separate switch.

As the train approaches the station, slow it down with the control rheostat so that it will stop when it strikes the dead section.—William Brown





Oiling Motor Bearings

THE hardest working bearings on any model locomotive are on the armature axie shaft. The photograph above shows a special lubricator for this bearing. Solder on a small folded brass box directly over the end of the shaft. Staff it with wool batting or, better still, with a small piece of felt cut to fit. The felt will soak up enough oil to lubricate the bearing for many bours,—Willand W. Checwippen.



A Kit of Ideas for MOTORISTS

Useful Hints for Emergency Car Work Contributed by Our Readers

A tool that aids in the temoral of a rear and can be quickly put together with an rou rod, a mection of pipe, and two regular asie nuts



Homemade Tool Aid In Removing Axle

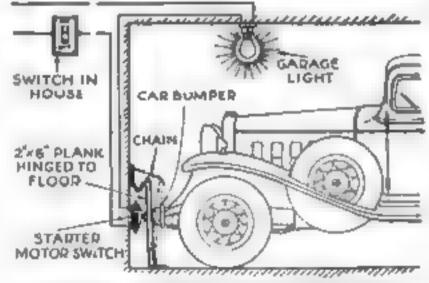
REAR axies that are to be removed can be loosened with a tool made from a twenty mich length of from rod, a twelve-inch section of pape large enough to fit over the rod, and two axie nuts. The rod should be the same diameter as the threaded end of the axie. One but, which matches the axie, is screwed balf-

way on one end of the rod and is welded as indicated in the drawing. The pipe is then shipped on the rod and the second nut acrewed in place. By means of the free threads on the welded nut, the tool is acrewed on the threaded portion of the axle, Bumping the pipe against the outer nut drives the axle loose,—B. A.

Board in Garage Turns on Light

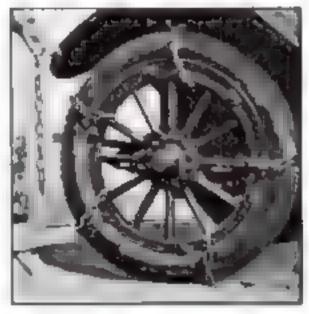
A DISCARDED automobile starter motor switch can be rigged to form an automatic control for the garage lights As shown in the idustra-.ion, the switch is fastened to the rear wall of the garage on a level with the axies of the car A board, two inches thick, six inches wide, and three or four feet long is hanged at its bottom in such a way that its upper end comes in contact with the switch button when it is pushed up against the wall. The upper end of the board should be sup-

ported with a short length of chain. When the car is driven into the garage, the bumper pushes against the board and operates the switch, turning on the lights. The hand brake is then set to hold the car in



Drawings shows how starter motor switch, a board, and a piece of plays can be used to make an automatic gazage light switch

this position. Another switch in the house turns the lights out. With the car in place, the lights likewise can be turned on. When the car backs from the hanging board, the lights will be turned off.—W. R. W.



An Easy Way to Make Your Own Mud Chains

EASILY adjusted mud chains can be assembled from scrap pieces of chain and double-ended snap fasteners. Each mud chain consists of a piece of chain long enough to fit snugly around the tire and the wheel rim. The loop end of the snap clamps to the link at one end of the chain. To apply the chains, the snap end of the fastener is hooked into the other end of the chain.—K. C. M.

Handy Socket Wrench

YOU can tighten a boilt that requires a socket wrench by using an end wrench and an adjustable wrench. Fit an end wrench over the head of the boilt in a vertical position. The adjustable wrench

is used to supply the necessary leverage as shown. It is best to place it close to the head of the end wrench to reduce the twisting movement on the handle of the end wrench — CR, W., Jr





RADIATOR shutters of the permanent type often become when and noisy To remedy this I devised the leather supporting strip shown in the illustrations.

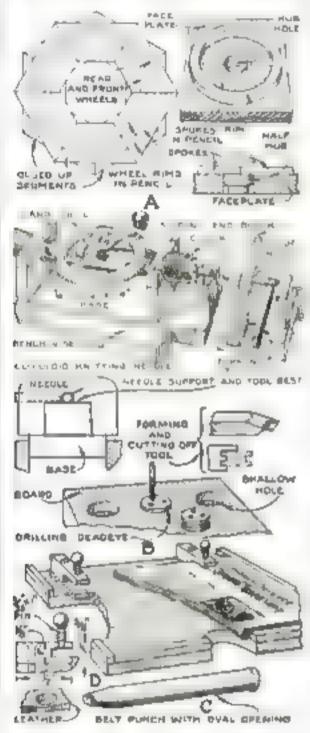


This fits over the edges of the shutter blades at the bottom of the radiator front. The strip was made from a piece of leather belting, about one and one half inch wide First, I marked the locations of the shutter blades on the strip. Then I drilled holes at each mark and cut narrow slits to the edge. The anti-rattler slips in place as shown.—J. G. P.



HELPFUL HINTS FOR THE MODEL MAKER

IN BUILDING a copy of the Potetar Science Monthly stagecoach model Diamond Tally-Ho, Carl W. Prints, of Mussilion, Ohio, saved time by glung up the stock in two layers as shown at A, the segments being wide enough to allow both a front wheel rim and a rear wheel rim to be cut out. After mounting the stock on a wooden faceplate, he marked the circles, laid out the spoker, turned a hole in the faceplate to receive half of a hub, and turned both rings. Then he

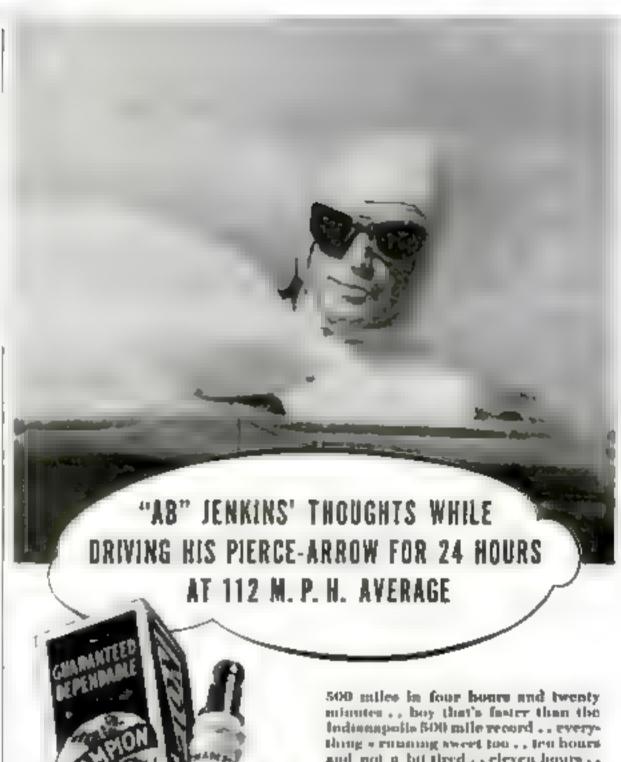


Simple ways to make wheels deadeyee, and blocks for models, and a special paper punch

placed a half hub in the hole, gloed the spokes for the front wheel in place against the rim and on the hub, and nailed on the other half of the hub. Removing this wheel, he made the sear wheel similarly

To make deadeyes for a model of Old Ironsides, he used a hand drill in a facture constructed as shown at B. Next, he critied a number of shallow holes in a board, dropped deadeyes into them, and drilled three holes in each deadeye with a No. 60 drill. The pulley block blanks were cut from leather by using a belt punch with an oval opening as shown at C.

Another homemade tool be devised is the punch shown at D for perforating magnzine pages for a loose leaf budder





Mr. Karl W. Whee, Chief Lugimers of the Pierce Arrows Motor for Lampachy anys of Ahampious Micros Arrows emple meers are just no acrogalismity particular in specifying

spack plags as they are on every other from on their specifications. Only Champingo have proved their depopulability in each tests as the remortable one made by 4h Jenkins in new of our Tunivas."

and not a bit theel a cleven hours . . Eve made over 1200 miles . . molting can stop me now . . spark plugs might what little things decide success or fullure - Just these Champions won't fed me .. they never have .. twelve bours. time is fixing with me . . no wonder every important race for the last ten years has been won by Chanspropertible it bew potented extra range as certainly being proved as rever hes fore a a believe me I won't begrudge them credit . . fourteen hours now . . black as buk too . . some strain to follow those markers a lateresting to think that a great piece of engineering mechanism like this car should depend on its little spark plugs . . Champion may be proud of all their world's records, but they'll have to thank us for this chance to show their stamina . . there comes the sun, and it's over twenty two bours . . I should be tired but I'm too happy to feel it . . twenty three . . the home stretch and NOW twenty four bourn . . yen boy, good for you Pierce-Arrow! . . good for you Ab old boy! . . and good for you gallant Champion Spark Plugs. Gosh I'm deaf . . what did be say . . 2710 miles in 24 hours at 112.91 miles per hour . . the world's greatest performance beyond a doubt . . Chempion Spark Plug Company, Toledo, O; Windsor, Ont.

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 Squibb Talcum, scented or unscented.





Completed model of the Treas

Capt. E. Armitage McCann

If It.E work now remains to complete the model of the battleship Tenu, if you have kept up with the instructions published in the preceding four articles in this series. The identifying numbers mentioned in the following description of the few parts still to be made refer to corresponding numbers on the ascembly and detail arrayings that appeared in the second article.

Ph W Dec 12, pp 72 and 731
Six large searchlights are placed on the model, but I omitted the four or more small ones which go on deck 20. Detail do shows how to make a searchlight. A piece of dowel is cut as indicated, and a strip of brase bent to shape and fastened with a dinched pen switch. I fastened four of the searchlights to the wings of platform 27 by drafting a hole through it and through this I dowed a sport of solder. The two which are placed on the wings of deck 20 have a small round base and are fastened with a pin

To the weather acreems of deck an should be fastened the ude lights, green to starboard and red to port. They should be double as shown in detail at. Metal or wood screens with bead lamps may be used to give a good representation of them.

At the stem stands the jack staff (r) to rarry the buson jack. It can be of wood, but is better if made of brass rod, because it is so slender and so hkely to be knocked. It is set in a bole in the deck or in a little socket. About 1/2 in up, to steady it, there should be a brass band to which is soldered a lorked wire, the ends of which are set in the deck. The staff should stand apright. The energy staff (63) is similar but lower, its band and support are about 1/2 in high, the less sloping slightly aft. Both should have trucks and be painted gray

At the foremast head there can be a conmission pennant—a swallowtail, which I have exaggerated somewhat in length. At the main there might be the admiral's flag of four stars on a blue ground. Just by way of decoration I bouted a flag at each yardarm—the cornet to starlinard because that is the crew recall and our ship arems to lack only a crow, the admiral being, let us suppose, in his cabin, and, to port, the battle efficiency flag. Of course, when she is under way, the juck should come down and the ensure go to the gaff

At the positions shown there should be bitts or botterds for. These are best cast from metal with holes for nailing down, but can be cut from wood or indicated with a 12 in. long plate and two escutcheon preson each side of the bitts are checks or leads (6) made from a piece of metal bent to shape and filed up. Right aft there is a pair of bitts cut in half and nailed on each side, in line with the hall, this forms a towing lead.

The radic antennas require careful work. Have a foulife were on each sage from yardarm in vardarm. Solder a fork of the thinnest wire to the ends of a 1/2-in, length of sliff wire. Make two of these and pla them on a board not quite as far apart as the distance between the yards. Start a thin wire at the after stretcher, go around the forward one, and leave enough to stretch down to the radio rount (ag). Solder the wire in position. Repeat for the other side. Lash the forward fork to the extreme yardarm and make a little book at the other end to book onto the after yardams, so that if tan be undone when you want to remove the center portion to adjust the machinery, if there is any Bore boses in the sides of the radio room and per the wires in position

The emergency antenna running to the top of the after tripod is omitted, as is the wire from the fore grow's nest to the jack staff and the wire from the searchlight plat-

form to the ensure staff
I also omitted a numb

I also omitted a number of mushroom and other ventilators, ammunition houts and small hatches, and a varied collection of small rung ladders and tubes running here and there, but all the prominent features are embodied—everything that is essential

The edge of the shell plating rises about 9 in, above the deck level, and inside that there is a 12-in, waterway. To represent this I ran the side painting 1/16 in, onto

I had first thought of leaving of all the deck stanchions because they are made to he down when the ship it in action, but she looked bare without them so I set in standard three-ball 5/16-in, stanchions (36-in., however, will do . These are set 3/32 in in from the edge. I spaced them somewhat widely apart, averaging \$\ in. Entity are required it is tustomary for ship model makers to buy their stanchions from dealers m ship model supplies. Stanchsons can be made, however, by drilling brass rod at the correct intervals and turning down between the holes in a lathe. This is a tedious Job, and various substitute methods are possible, such as using this twisted wire or very thin split cotter pins. It is all a matter of personal preference and ingenuity. A sketch was given in the December issue of the regulation battieship stanchions, but they are much harder to make

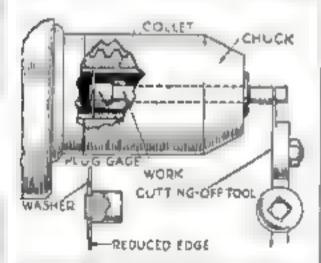
On the stern at the position indicated, the name of the ship TEXAS should be painted in 14 in, high block letters. This lettering is black. Then your model will be complete

She has been quite a hit of work to make but worth it. When she is ready to hunch, whether figuratively on the mantelshelf or actually in the water, you will have the satisfaction of knowing that you have constructed an accurate, good-looking scale model of one of the finest and most powerful American battleships.

UTILIZING SHORT STOCK IN A SCREW MACHINE

A HAND screw-machine job that called for a large quantity of steel rock, one-form in length was turned out in an economical way by using a lot of waste pieces that were available instead of cutting them from long stock. Because these pieces were short, it was found necessary to chuck them by the "work" ends and insert them from the toolside of the chuck. To facilitate this, a simple gage or plug was made as shown

A abort piece of stock was turned down to fit the hole in a large washer, a shoulder



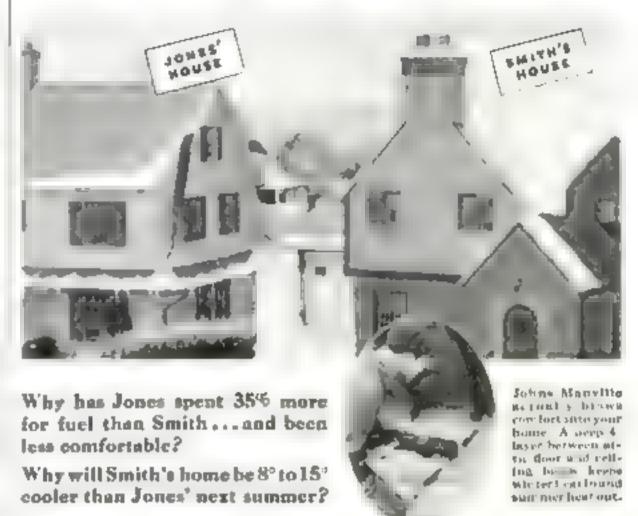
Screw-much no churk broken away to show how a gaging plug was immeted behind the collect

being left to keep it from slipping through the box. The turned down end was then riveted over to bold the washer in place. Once more the plug was chucked and the washer turned down to the inside diameter of the spindle in the screw machine. The thickness of the washer also was reduced around the edge,

The plug was placed in the spindle, followed by the collet to the usual manner, and it then served as a dependable gage for

length.-] mor E. Sexaris.

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(LEFT) Most house

here boltow waits, past passifeway for

summer heat and winter cold.

(RIGHT) Rock Wool

blown late this space

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CHEMICALS FORM QUEER UNDERWATER GARDEN

AMONG the many attractive things that can be made by the amateur chemist, the chemical garden is one of the must unusual. It can be "grown" in a bottle vial, glass vase, fish bowl, or other transparent receptacle. When the proper chemical is introduced into the liquid, a small treelet will shoot up.

fall the glass receptable about three fourths full of a muxture of one part of water glass (silicate of sods solution) to bree parts of water thus making a twenty-five percent solution. Now drop a small crystal of one of the following salts in the aqual blue vitrol (copper sulphate) for blue trees, potassium dichromate or, as



an alternative chloride of iron, for orange trees, potassium permanganate for purple; nickel surphate for green; and lead acetate or silver nitrate for white. These salts are usually found in the amateur's outfit, and they are easily obtained at a druggast's

Watch the crystal for a moment; if it starts to grow, all right If it doesn't, ado a very small amount of pure water glass to make the solution stronger. When the first crystal has grown to a fair size (from 1/2 to \$4 in.), drop crystals of different colors over the bottom of the receptable

After the trees have stopped growing carefully siphon off the remaining liquid. The glass may then be fisled with water, which reveals the colors of the trees clearly. However, if the garden is to be set in a place where it may receive a good deal of justing, it is best to prepare by cooking, a heavy gelatin pudding. Take care to keep it clear and transparent. Pour this in around the formations instead of the water and allow it to set until the gelatin is firm.

Several photographs of the author's chemical garden have been taken, but while they show the general shape and size of the trees they convey no idea of the colorful effect—green and greenish-blue trees grown aroung a group of sheds that are red and orange in color

The chemist may vary the design by placing a small model of a galleon or pstate ship or a tiny treasure chest on the bottom of the bowl, for the garden resembles see peants.—L. L. Hyler.



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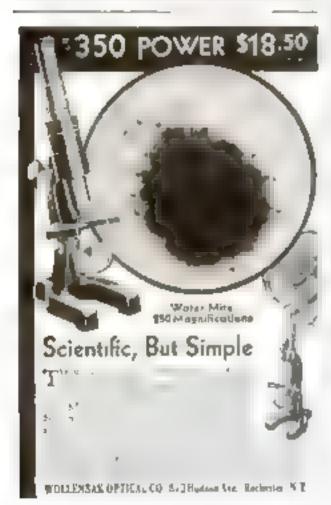


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Our Construction Kits



BY SENDING 51 to the Popular Science Hometraft Guild, you can obtain a construction kit of raw materials for making a highly simplified 13 in long model of the new American built liner Mankattan, The kit contains a piece of white pane for the hull, sowed to the approximate shape but otherwise unfinished, wood of the correct thicknesses for making the various deck unita, bridge, funnela, fifeheats, and similar parts, sheet metal for the rudder, anchors, propellers; soft wire for the masts, ventiatom, and davids-in fact, everything but the paint A blurpr of showing all parts full size is included

Because of the small sare and unusual simplicity of this m mature model, it is an excellent one for beginners and will serve as a pleasant introduction to the fascinating bobby of ship model making.

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kits avintable are also listed. Each is accompanied by instructions or blueprists A. Whaling ship model Wanderer. All the raw materials—wood, wire, fishing line,

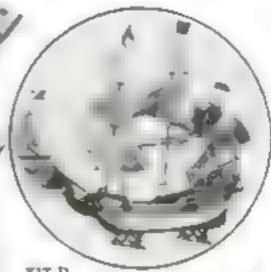
chain, celluloid, and everything but the paints.

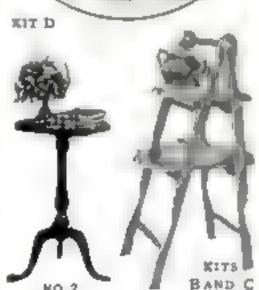
together with Bluegrants Nos. 351, 152, 153,

and 154. The hull is 20% is long \$6.90 AA. Same with hull lifts sawed. .. 7.40 B, Folding multin stand in selected sugar pine, 11 in. wide, 19 in. long and 33 in high when open. All the necessary wood cut to approximate sizes but not machined

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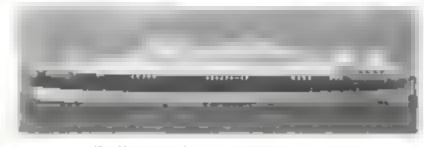
E. Battleship model, U. S. S. Texor, 3 ft.







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HOLDING FINE DRILLS IN A LARGE CHUCK

THE AMATEL R mechanic often finds it necessary to use fine wood and metal drills in chucks too large to grap them firmly His first thought is to wrap the drill with tape, and be soons finds this to work only indifferently II a drill chuck such as is used on small lather is available, he can sap a rod of metal or hard wood rato the spindle hole at the rear end of the chuck, then tighten the set screw



How the length of metal rod is cut in making the improvised thuck for small drills

and grap the rud securely an a larger drill chack

When no small check of any kind is available slot a 2-in, piece of , in hardwood dowel for a distance of 1½ in,, slip the dr.ll into the slot (being careful to center it), and grap the dowel very tightly in the chuck. The wood will be somewhat crushed by the jaws of the chuck, but it will hold the drill firmly for a considerable time

Where a good deal of driling is to be done, it is better to use a metal rod Brasa rod 5/16-ia, in diameter serves very well. Drill a 1/16-ia, hole through the rod ½ in, from the end and back saw it carefully from end to end. With a triangular file work out a groove 1/6-ia, in depth down the center of the sawn faces to hold the drill. Now file away a little of each face from the rivet hole to the nearer end as shown in the drawing. Insert a coose for any copper wire rivet in the hole. This amprovised chuck will open under sight pressure and grip fine drills like a buildog. The metal rod will last indefinitely.—Jack Hazzaro.

MAKING ROUND HOLES IN CORK STOPPERS

WHILE a cork borer is not ordinarily a part of the tool equipment in the average home chemistry laboratory or workshop, the amateur can easily make holes in cork stoppers and the like by the following method. Heat the tang of a small rat-tail file and burn the hole through the cork to approximately the right diameter, then carefully round it off with the rat-tail file.—George A. Smith

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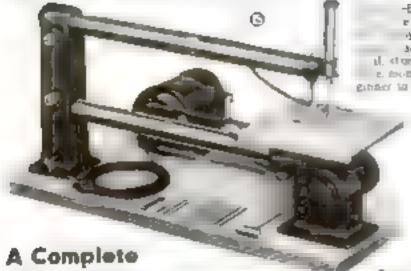
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TRAILING CRYSTALS WITH A MICROSCOPE

(Continued from page 47.

trazsmits light. No other crystal family, however, supplies such a limitless profusion of forms, there being, apparently, no end to their deutate, lary patterns. Every snowflake is a distinct creation in a fraten world that contains countless trillions of other forms. Here geometry is wedded to sheer beauty, in looking at our flakes, we must not make the mistake of using a high powered objective. Anything from twenty-five to fifty diameters will be plenty

STUDENTS of ice crystals have found two main classifications—the tubular and the columnar. Often the two forms are combined with the result that a column or rod of hexagonal section will have at one or both ends a hexagonal plate. Star-shaped crystals are most abundant when the temperature is just a bit below freezing. The hexagonal plates make their appearance in great profusion at lower temperatures.

Examination of the frost crystal that forms on windows reveals extremely interesting uplies. A cold piece of glass moistened by blowing the breath against it, is placed in the garage where the moisture will freeze Studying this specimen, we find the tiny little bricks of water have grown together, each, it would seem, clinging to the other for companionship in this harren and frozen world.

Assic from the crystals already mentioned, there are many others in the family medicine thest and the kitchen. Then at the drug slow we may purchase copper sulphate, and the saits of the alknown metas.

If we can obtain some crystals of galena or garnel, we can make some interesting obervations. Galena, sulphide of lead, is the chief ore of lead

We cannot examine this or any other opaque crystal as we did the transparent crystals. Galera is a dull gray and will not pass light. Hence the little interor underturals the stage of our instrument will be useless and we must manage to throw the next down upon the surface of the crystal. This is best done with a reading glass with a universal joint, set on a stand so that it may be focused at any point

HAVING arranged the light source, we proceed with the examination. Here two hundred diameters or more, depending upon the skill of the operator may be used. First, we must potch the surface of a tiny piece of gasers. To do this, it is held against the side of a fine emery wheel and, when ground flat, is polished with rottensions and water

The door the piece of galesa, resting on a slide is placed upon the stage of the macoscope. Now the light is focused on the surface of the galesa through the medium of the little reading glass and its universal joint

Working at hight with a microscope, we find that ordinary electric light is tiring to the eyes. To overcome thus, we build a special agot filter that is a real joy to use, and is easy and inexpensive to make. The inside of a coffee can is pointed black after small holes for ventilation have been punched near the top and a large hole made for the escape of light. The beam of light from the can is passed through a solution of copper suphate tor blue stope; arranged in a little roblamer made of two small pieces of window glass. The wooden sales and bottom of this cetaire made waterproof with tar or pitch.

Just enough of the copper sulphate is dissolved in water to impart a good blue color. This cell is then placed between the light from the can and the mirror on the microscope. In this position, it filters the heat out of the light and provides an illumination that does not cause eyestrain.

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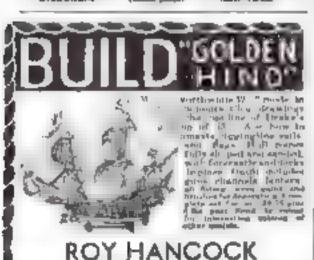
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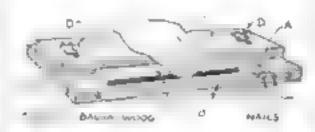


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The fence or guide C is fastened by means of two bolts and wing nuts D at a distance from the blade equal to the width or thickness of the strips to be cut. The balsa stock is then pushed along the base block against that edge of the blade which forms an obtuse angle with the board—the forward edge.—Barry Telvals.



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A ½-m, hole is bored through the grip about 1½ in below the break, and a ¼-in, bole is bored down from the top of the handle to meet the first bole. This small bole is counterbored with a ½-m, bit to a depth of ¼ in. Then a ¼-in, machine bolt in serted, its



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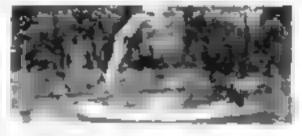
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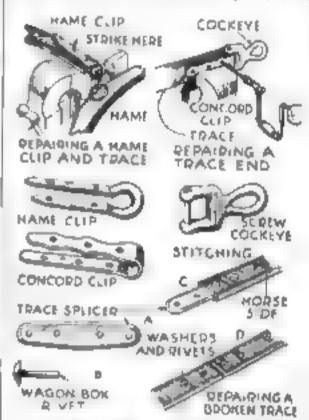
By L. M. ROEHL

New York State College of Agriculture

ORE strain is placed on the traces or tugs of a harness than any other part. consequently these most often break. There are three points at which repair work usually is required. The bathe clip becomes ween out, the cockeye is worn through or trace out at the end of the trace, the trace wears thin and breaks where it chales against the leg of the horse.

To replace a hame clip on a tug,

I. Remove the old rivets. This may be done by champing the tag securely in a machimst's or blacksmith's vise and cuttleg of the heads of the rivets with a cold chief and a baromer, or the heads may be center punched and drilled off, and then the rivets punched out. If a two-hole clip has been



How a hame c'tp and a Concord citp are put un a race and how a broken rug is an leed

tuced, it may be desirable to replace it with a three-hole clip, as it is longer and will give added strength

2. Hook the hame clip into the hame staple and drive it in place on the tug with a hammer. The clip can be forced down tight on the tug by resting one side of the ring of the clip on the vise or other solid metal surface and firmly striking the other side with a hammer

3. Draw the holes in the clip in line with those in the tug with a pointed tool such as

a scratch aw

4. Use hame rivets or other soft iron rivets. driving them in from the horse side of the rise or gring a chamter on the points of the rivets and they will drive into the holes freely

5 With hack saw or cold thisel, cut the ends of the rivets so as to leave projecting ends of not over 36 in., and with the bad end of a ball peen hammer rivet the dip down tight, neatly rounding the ends of the

If a cast cockeye has been used and is worn out, remove it with a hammer and cold these and replace it with a screw cockeye. If the cockeye has worn through the leather at the end of the trace where it is



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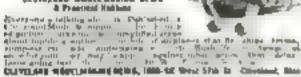
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forded around the bolt of the cockeye, it is repaired with a Concord clip. Proceed as follows

 Cut the turn end of the trace off square. Place the cockeye in the clip and the clip on the trace. Then clamp it in a metal vise in its final position on the trace.

3. With a carpenter's brace and a metal drill of the same size as the holes in the clip, drill holes through the trace for the rivets.

4 1, e soft con rivets, drive them in and cut them off so as to leave projecting ends of not over 'a in, and rivel them down light. If there is a tendency for the cop to spread away from the leather, the diveling may be done while it is clamped in the vise, using a sledge or other heavy metal tool to hold the rivet in place while hammering

IF A TRACE is broken it may be repaired with a trace splicer, which is a piece of metal as shown at A. If a splicer is not at hand, a metal plate may be cut 4 by 1 by 3/4 in, and drilled with four 54-in, holes I in apart. The ends are rounded and the edges filed or ground off for easy insection between the layers of leather

Having a splicer, the repair is made as

I. The broken ends of the trace are cut square to the edge

2. Place the aquared ends together and the splicer on the leather with an equal part on each end of the trace, and mark the places for the rivets

3. Holding the trace in the vise, drill holes for the rivets the same sizes as the holes in the splicer. Wagon box rivets B are desirable because their large thin heads make a smooth surface for the borse side of the trace and will not chafe the home

4. Drive one end of the solicer between layers of leather as shown at C and line up the holes by the use of a scratch swl or other pointed loof

5. File or grand the ends of the rivets somewhat pointed and drive them through the trace from the borse side

6. With back saw or cold chisel cut off the ends to an to leave not over 36 in. for rivet, ng

7 Place washers on the rivets and rivet the emp down light

8 Drive the other end of the sphere in place and rivet in a similar manner as at D

SPECIAL LATHE CENTER FOR USE WITH CHUCK



SOFT center like that shown in the A sketch below will make it unnecessary to remove the universal chuck from a lather when some small job comes up that must be machined between centers. The frequent removal of a large chuck is often incon-

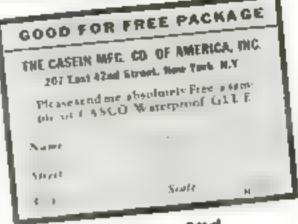
vancent. In use, the center is held in the unaversal chuck with the index mark under the No. 1 jaw The work is driven by a dog with its tail pressing ngainst a chuck iaw - J.H.D.



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A 1933 Randy Chart of place and specifical and, showing all of Johnson's 7 green memora. Write fact Just copy.

JOHNSON *SEA·HORSES*

METAL SPINNING

(Continued from page 65)

against which the revolving tailstock center presses. Thus the form, blank, and button rotate as one piece. Pressure of the tool against the disk causes the metal to flow around the form, conforming perfectly to its outline. The metal is stretched, com-pressed, and bent in the process; and the secret of good spinning is to effect these changes without creating grooves, crucks, or other imperfections

You can make wood forms directly on the spinning lathe, but metal ones require a metal working lathe or an auxiliary carriage for the spinning machine, First, equip your spinning lathe spindle with an intermediate chuck, unless you can screw the form directly

on the spundle

The intermediate chuck is a collar that is screwed or otherwise fastened on the end of the spindle and has projecting from it a threaded stud from 16 to 1 in. long. Some metal spinning lather are equipped with a threaded taper screw on the intermediate chuck. However, Stalitzka has found that such taper threads are not as safe and have many disadvantages when compared with the ordinary straight type. The straight thread is easy to cut, and corresponding taps can be obtained for threading the wood or metal chucks.

ON THE spinning lathe illustrated, the intermediate chucks have \$2.10. studs with 10 threads per inch for light and medium work, and 1-in, or larger study with U S. Standard threads for heavier spinning

After the chuck blank is drilled and threaded to fit the intermediate chuck, turn it to conform to the inside or outside of the desired spanning. Before doing this, draw a full sized section of the article you want to make, and prepare a sheet metal template for use in checking the form

Wood chucks can be used where one or two articles are to be spun but meta ones are preserable for larger quantities. In addition, they give more accurate results. Many types of spinning require sectional or knockdown thucks. These will be discussed in a

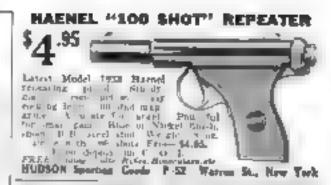
tater article

You can do much spinning with a single tool that consists of a 14- or 1-in, red of toni steel with an 18-in, knodle at one end and with the other end shaped somewhat like a snake's head. The business end must be hardened and poinhed. This description probably gives the impression that such a tool is massive. It must be, for it receives rough usage. Many of Stolitzka's took have handles made from baseball bata

IN ADDITION to this common spinning tool, there are others with round hoses, pointed noses, fishtail noses, curved ends. and with wheels of various forms. Wheels are for specialized work mostly, so that the beginner need not worry about them. How ever, a tool equipped with a small pulley wheel set in a slot is employed for animing rolled edges

You pught also to have a tool designed to cut metal, for trimming edges. This can be made by setting a fugh-speed lathe tool bit in the end of a steel rod or tube and grinding the bit so that it will shave down the metal when applied to the edges. Finally, include in your tool list a piece of broom handle with one end shaped like a blunt cold chisel. This is the "back stick" so Indispensable to the spinner. It is held against the metal opposite the spraning tool during the early stages of spinning, to prevent chattering and buckling. Various spinning tools can be purchased from manufacturers

As for metals, you can employ almost anything from soft (Continued on page 89)





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METAL SPINNING

(Continued from page 88)

alumnum to stainless steel. Probably the easiest metals for the beginner to tackle are copper and aluminum. Brass and sinc also are not difficult to work. Always start with a disk, the radius of which is determined by measuring around the form from the center of the free end to the edge.

When copper and some of the other metals are subjected to bending and stretching, they become hardened and stiff, and must be annealed before the work can be finished. Perhaps several annealings will be necessary if

the metal is to be deeply drawn.

Anneal copper by beating it over a gas flame or with a blowtorth until it becomes soft, then cool it in alr or water. Brain is softened in the same manner; but before heating, it must be hummered in order to "loosen up" the me al and prevent cracking during heating. Either rest the work account wood and pound it with a metal hummer or use a wood mallet and a metal rest such as a liminish a stake. Do not make dents or otherwise change the shape

ALUMING M usually does not require anpeaking, except for deep drawing; then it must be treated to a furnace. Steel has to be annexted at a high temperature to a furnace. Zinc is softened in the same manner as copper

After your equipment is in order and your form or chuck made, proceed as follows

Place the metal blank (dak) against the chuck, and against the opposite side hold the wood or metal botton, which is nothing but a round piece of maple, aluminum, or strel with one side flat or curved to fat the work and the other containing a shallow hole to receive the tallstock center. Run the center against the button with considerable pressure. Lubricate the blank with lard or cup grease so that the tool will not encounter excess a resummer.

Start the lathe and hold the tool as near the center of the disk as possible, drawing it towards the edges white enerting pressure. Hold the handle of the tool under your arm you may have to use the back stick to prevent bucking. The metal will change his shape with startling case and capidity if you have done everything properly. When the blank has been spun to conform with the chuck, trim the edges and remove for sub-

sequent finishing

Just a word about the design of forms. Remember that the pressure of the chuck against the blank is all that causes the latter to revolve. Therefore, you cannot start with a chuck that has only a point touching the disk at the center. Design the chuck either with a flat center large enough to grip the blank, or else use more than one chuck, the first of which is designed so that the work can be started

The wisdom of this will be seen in the next article in which the making of a nontipping ash tray will be described.

THIN, TOUGH PAPER FOR MODEL MAKERS' USE

A rarry and exceedingly tough "parchment" tissue that is well suited for covering the wings of model airplanes, making sails for ministure ship models, and similar purposes can be prepared easily at home. A good grade of these paper is cut into sheets, and each sheet is immersed for ten seconds in a solution of four parts of water to which has been added one part of sulphuric and. During the dipping process the paper is held at two corners by wooden spring clothespins. The sheets should be thoroughly washed in running water before being set aside to dry.—K.M.



THE "IDEAL" LAWNMOWER SHARPENER

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SPECIAL ATTACH-MENTS MAKE IT AN ALL AROUND MACHINE

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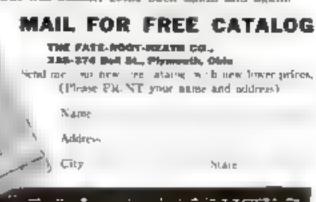
John Del Zoppo, Hollywood, Cal writer: "We are running an average of 35 to 50 sharpening jobs per day all of which are done on the Ideal Sharpener " Glesa R. Knick, Troy Ohio writer "From the first of April to the middle of May I sharpened 140 mowers." J W Bures, Cuyahoga Falls, Ohlo writes "I am buile of through patulaction a wonder ut future business and have the promise of over 100 mowers already for next year," Noes C. Roce, Rochester, N. Y. writen: "I have to date sharpened 785 mowers at \$1.00 apiece. I started in my cellar but the place was not large enough so I had to rent a place a week after I got my Ideal " Wm Sedusk , Waterviet N Y writes "The Ideal Sharpener is a wonder No one can turn out a bad Job on it Thomas West, Lynn, Mass. writes "I do not know of another muchine that will do better work or turn not \$100 quicker or easier than the Ideal Sharpener." W. C. Fink, Pittsburgh, Pr. writer, "I turned out 604 Jobs and my standard price is and always has been \$2.00 per mower."

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MAKING ENLÄRGEMENTS

(Continued from page 72)

for a 5 by 7 in, piece. The spal glass should be at least one size larger than the film you wish to enlarge. If it is not, the edges of the film will not be properly lighted

The light reaching the lens from the negative is projected onto the sensitive bromide paper in the form of an inverted image, just

as in an ordinary camera.

The mechanical construction of a photographic enlarger should be such that the film the fiance of the lens, and the bromide paper are held parallel to each other. If they are not, it will be impossible to focus all parts of the picture area at the same

"HE film negative and the brosside paper also should be held flat. In factory built enlargers, this is accomplished by squeezing the negative between two pieces of clear class, and the bromide paper is either held by the edges against a flat surface or placed

under a piece of glass.

The simplest type of enlarger is a lighttight, boxlike structure containing an elec-tric light bulb and a diffusing glass at one end, the negative carrier hear the diffusing glass, and a holder for the bromide paper at the other end. The lens is fixed at the proper point between. Fixed focus enlargers of this kind are sold at around \$12. They do good work and are quite intisfactory if you are willing to limit yourself to one tive of enlargement

It is, however, far more deprable to have an enlarger capable of adjustment for picture size and picture composition. It so often happens that you want to enlarge unly a portion of the original negative

An enlarger meeting these requirements is the popular vertical type, one of which is shown at the top of page 72. Various makes and models sell at from \$10 to \$75 or more The light-tight housing of the vertical enlarger can be moved up or down on its support to change the size of the picture. In some models focusing is automatic, the lens being moved by merhanism operated by the motion of the main bousing

Another illustration on page 72 shows a d flerent way to make enlargements. Instead of buying a complete outfit, you remove the ground glass back of your regular camera and clamp it over the front opening in a special attachment that contains the light, the diffusing glass, and a negative holder The attachment can be used with any plate or film pack camera having a removable of bineed back or with roll film cameras if the back construction makes clamping possible

OF COURSE, you have to build your own bromide paper holder. A bread board firted with feet to hold it on edge does nicely The beomide paper can be held on the easel has formed by thumb tacks or more elaborate clamping arrangements

There are many other forms of enlarging apparatus available. These differ widely in use of film handled, quality of equipment, and degree of enlargement possible. All, however, operate on the same optical principle

Here is the way to avoid the common begiance's (youble-

First, make sure that the negative it evenly illuminated. You can check it by looking at the source of light with your eye in the lens position. Try it both with and without a negative in front of the diffusing glass.

Second, he sure to use the correct grade of bromide paper. If your negatives are somewhat gray, buy contrast bromide

Third, set up the enlarging outfit in a dark room that is really dark. See that your dark-room light is fitted with prange-colored screens of a type (Continued on page gr)

BIG STEAM ENGINE



Electric Model

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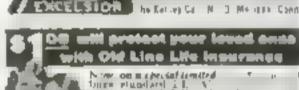
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MAKING ENLARGEMENTS

Continued from page 90)

listed as infe for use with bromide paper. The latter is many times faster than velox and similar developing papers. Avoid placing the enlarger close to a white wall.

Fourth take extreme care in facusing Always use a magnity ne glass to help you get the image sharply defined. Use the lens water open on portraits if you wish, but stop it down for any picture where you want extreme detail clear to the edges.

but he aways develop aromade paper for the full time recommended by the manufacturers of the paper. If you use one of the standard, bromide-paper strength, metol-bydroquinone urve oper formulas, this time will be from 1 f to 2 , minutes. Overexposure, and no attempt to save the print by underdevelopment, is a mistake every beginner makes

Sixth, keep your enlarging apparatuespecially the negative and bromide paper holders, acrupulously clean and free from itust. It is a good plan to have a camelahair brush on hand and dust off both sides of the negative and both sides of each glamevery time you change negatives.

Prizes for Best Indoor Photographs

IN THE first of our \$100 photo contests, which was for the best ordoor pictures taken during the months of October and November 1632 (see P.S.M., Nov. 32, p. 82) the following awards have been made

FIRST PRIZE, 850 Augusta Steumpen, Philadelphia

Avery II ood, II admosth, Ohio

THIRD PRIZE, 510 I. F. Kreps, De Forest, But

FOURTH PRIZE, 85 Marion Hatter, Muldlebury, VI

FIFTH PRIZE. 35
Ruth E. Boyd, Ashton, Lee Co., It

SIXTH PRIZE, 33 II L. Prout, Renszelaeruille, N. Y.

HONORABLE MENTION—R. E. Buller, Durkam, N. C. Genege Cael non, Chicaga, Ill., R. Deime Brock ivn N. Y., Joseph R. DiPaima, Juckson Heights, N. Y., H. E. Essel ityn, Detroit, Mich; M. Friedman, New York City. Frea Hass. Je Naws City Joseph, Norman R. Hart Taney, ome, Mo., Homer Huck y. Salem, Ore.; Aaron A. D. Jensen, Los Angeles, Calif., Elvie M. Keyler, San Francisco, Calif., V. A. Meder, Juck ion, Mich; H. L. Mafett, Manson, Mass.; Abraham Molind, Philadelphia, Pa., J. R. Morton, Washington, D. C.; Elde L. Pulmer, Edgewood, R. L.; H. E. Rutland, Presque Isle, Mainey, Aethur W. Sacherer Ojal, Calif.; J. M. Stofan, Garbels N. J. St. L. Thiebaux, Jersey City, N. J. Edward K. Wintcomb Lancaster, N. H.

The winners of the December Photo Coo est will be announced next month.

'This'll be Funny'

they shouted as she sat down to play

but a minute later...

I guess we're stuck for the afternoon, sighed Jane. At the chin began coming down in torounts.

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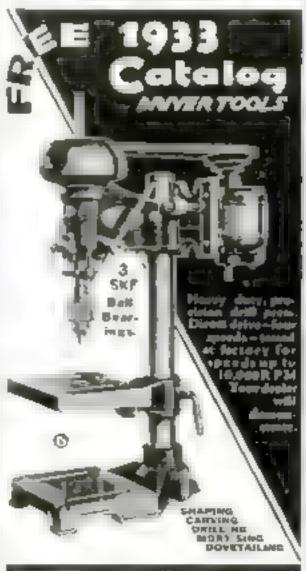
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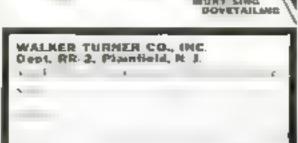
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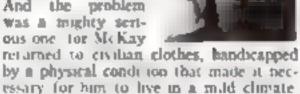
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American School, Dept. E-160, Propel at \$6 St., Chicago

HE MADE A CARFER OUT OF A HOBBY

THE first problem Herbert C. McKay faced upon his discharge from the Army at the close of the World War was the question of making a living And the problem



He settled in a small town in central Florida, where living conditions were ideal for him. But the only vocation for which he was trained, that of bacteriology, was a blank as far as that town was concerned. Forced to do something, Herbert McKay determined to make photography, his favorite bobby, help him earn a living Devoting himself to this hobby with inlensive thoroughness and with an eye to the practical side of it, he soon started to earn small sums of money on odd tommercial photography jobs.

It occurred to him that has knowledge of microscopy could be applied to photography in a way that would attract popular appeal. His first micro-photographs of insect and other natural life were bought by several magazines that recognized their unusual possibilities. This smad success turned McKay into the held of general magazine work. In a little more than a year after his start, he was selling unusual photographs of all types and subjects to many magazines in this country and abroad.

IN 1922 Mckay took a job as camera-man in one of the Hollywood production companies, but after one season returned to Florida where he began work on a book which was to be the first one ever published on the subject of amateur motion picture photography. This book was followed by others, and in recognition of his services to photography McKay was awarded with an Associateship in the Royal Photographic Society of Great Britain. Two years later the same society awarded him with a Fellowship, the highest photographic bonor available

In 1926 McKay joined the staff of the New York Institute of Photography, and two years afterward took over the direction of the educational activities of the Institute. In the space of eight years he had become one of the most widely known authornies in the photographic profession. Beside Dr. Mees of Eastman Kodak, he was the only man in the country whose photographic work had carned him a 1 c. minuad on page 93,

Go up, Young Man, GO UP !

The World's Greatest Opportunities are in



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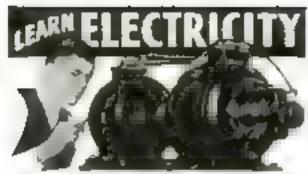
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Secrets of Success

HE MADE A CAREER OUT OF A HOBBY

(Continued from page 92)

listing in "Who's Who in America."

I nder his gindance a course in instruction by mul of the making of photographs for publication was prepared, and it proved highly successful. During the tune he has been connected with the Institute, McKay has not allowed his work in the book and magazine fields to Lipse. Today he is the author of sur published text books, in addition to hundreds of articles in American and foreign magazines. His life is the story of a real success that grew out of a bobby which had been applied with intelligence and determination to solving the problem of making a living

OLYMPIC STRONG MAN WAS PUNY BABY

or Miller first saw the light of day on July 816. 1709 an Parkesburn Pa. If the docfor had been right, it would have been his last glimpse as well For he critishly daln't look strong or well enough to live. But, contrary



to expecta noes, this puny, sick baby managed to survive-and, today, at 24, he is one of the world's foremost weightlifters. That interval of twenty-four years represents a shiring example of wholebearted persistence, firmly directed by well organized framing

When Joe Miller was eight years old, he was far below average strength, a poor match for any of his playmates. Two years later came a "blessing in disguise" Forced at 1en to seek work because of straitened family conjunctances, he bired out as a chore boy on a farm So he began a life of fresh air surpre whose some food and plenty of hard manual labor. At welve he had taised his physical ranking to about average for his age and it was then that his physical ambitions started to take shape

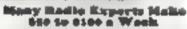
An advertisement in a local newspaper of a physical training course caught his eye. He sent away for a booklet and devoured its contents avidly. The scarcity of family funds prevented further action but his enthusiasm and ingenuity was unchecked. Pending the time when he should have enough money to enroll in a comprehensive health-building and physical training course, he set to work rigging up his own apparatus. Discarded inner tire lubes were turned into chest expanders door knobs became dumb-bells, buckets of water served as kettle weights.

At unreteen he (Continued on page 94)



I'll Train You at Home to Fill a BIG PAY Job in Radio

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J. E. Smith. President, Dept 2CP3 National Radio Institute, Washington, D. C.



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Secrets of Success

OLYMPIC STRONG MAN WAS PUNY BABY

(nime d from page 4)

became interested in "the body beautiful." He took up muscular control and a year later, at a period when he says he was able to outwork and outlift any man on the neighboring farms, he won a posing contest, open to all amateurs

The following year he realized his original ambition to study physical training in a thorough, organized manner While attending a strong man show in Philadelphia he met the director of one of our best known and most reliable physical training schools. To this man Joe Miller ascribes all his present strength and development. In fact, he goes so far as to say that this teacher is "the most as ounding canonale of Health Streng h and Developmen that ever lived

The enrolled for veveral courses in this man's school and trained under him for three years. In 1931 he was induced into entering The Middle Atlantic Weight Lafting Championship. Men in these contests are search on the total number of to mas lifted in three diverent ways namely pressing snatching and jerkeng Jue Mover in his first control made a SCOTE OF T

This year he won the same championship with a score of 682. At the Olympic Trials he lifted 603 pounds. Un Parally he has done as we has "If and ""I which is pre-y close to the record for his class Leaders in any field from weight I fing to sky writing get to the top and stay there because they always believe that there's more to be learned about their own particular specialty. Joe Miller's amh ion is to become still stronger be ter built and to further increase his weightaffing records

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THIS department will give \$5.00 for every true success story submitted by readers of Popular Science Monthly, and which is accepted for printing in this magazine,

Manuscripts will be judged on the Individual merits of the case and circomstances involved. Only stories in which the author's success, or that of some one known to the author, has been gained by some method of educational guidance, fitness for the job, or application to the work will be considered. We are not looking for the "get-richquick" type of story.

Manuscripts must be confined to 500 words or less. They must be true and, if accepted, authors must be prepared to give us signed statements to the effect that they are true. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected stories unless postage is provided for this purpose. Address con-tributions to Success Story Department, Popular Science Monthly, 381 4th Avenue, New York City.

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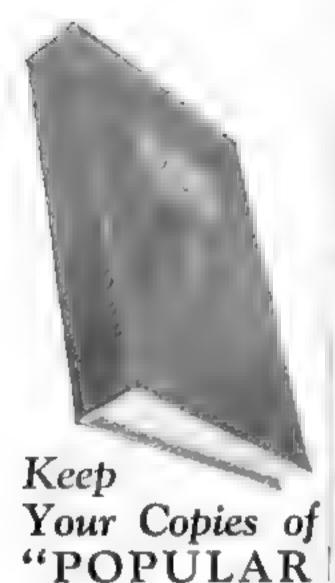


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LARGE BEVEL HELPS IN FITTING WALL BOARD

ANY home owner who is about to line his attic, basement, or garage with wall board will find the work easier if he makes a large wooden bevel-square for transferring angles accurately. The bevel is placed in the angle where the sheet of wallboard is to be fastened and is adjusted to fit exactly. Then the thumb out

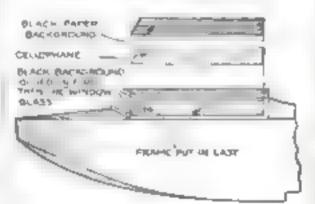


at the joint is tightened so that the bevel may be used to mark the angle on the wall board.

The bevel may be made of oak, maple, or any hard wood. A useful size for the beam is 36 by 2 in. by 4 ft. 6 in., and for the tongue. 16 by 2 in. by 3 ft. 6 in. A slot 36 in. wide and 3 ft. 6 in. long is cut down the center of the beam, leaving 5/16 in. of wood on each side of it, and the bottom end of the slot is cut at an angle of 45 deg. Then the tongue is fitted and the joint end worked to a half circle A 11/2 by 5/16 in, carriage bolt with a thumb nut, two washers, and a lock washer is used to fasten the parts together. The end of the tongue is cut on a bevel so that it will close into the slot.

Such a large bevel may be used for other purposes in laying out work of various kinds.—C A. K

REALISTIC WINDOWS FOR WHITTLED MODELS



NEAT looking windows for models whittled from wood, such as the airplanes described in Donald W. Clark's series of articles, can be easily made from transparent cellophane wrappers. Carve out a space the same size as the window and from 1/32 in. to 1/16 in. deep, according to the size of the model. Then cut a piece of cellophane and another of black paper the same size as the window or very slightly larger, if they are larger, they will stay in place better while you are workmg. Glue the black background in the recess and put the "wandow glast" over it Then glue in whatever framing for the window the model requires, or carve an artificial frame.-JOHN C. ZIMBECK,

MOULDING A MIGHTY ARM



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USE BIRTHCONTROL TO RESTORE FORESTS

(Commund from page 17)

in New York, Madrid, Moscow, and other centers supplied their best species. India. Palestine, Spain, China, Guaternala, the Canary Islands—a total of forty countries—sent seed.

Then the planting began, it was not enough that one planting from the Canary Islands should be attempted. Seed from six different locations within those islands were planted in order that a comparison of seed from parents in different geographic locations, grown under similar conditions at the

Institute, might be made.

Never in the past has such a test been made. Infinite pains were taken to have conditions uniform throughout the large nursery and, as a further miceguard, seeds from each source were planted in two different parts of the nursery. Each year their height, diameter, and branch measurements have been recorded and at the end of the second year the vigorous and normal growths were transplanted to the arboretum where their progress is being followed year after year. The runty wedlings were discarded.

AS SUPFR FORESTS grow before their eyes, the scientists at this novel laboratory learn that the fastest growing pine yet tested is the Monterey of California. Others among the outstanding pines are the Spreading-leaved from Mexico; the Cluster from France, the Italian Stone from Italy; the Coulter from Southern California and the Slash and Loblolly of the southern states. From one, or possibly an intermisture of two or three of these, achieved through successive generations, America's super-pine, straighter, taller, stronger-grained than any the world yet has seen, may be developed.

Meantime the Institute is producing rapidgrowing races of trees and powerful individuals among those races. It collects seed from particular trees, plants them and observes the results. In a single test, seed was collected from 765 individual Western Yellow pine trees in sixty counties of twelve states, and in another were the offspring of , 50 of the largest hybrid and black walnuts on the

Parific coust

These tests revealed that within a given species appear many local strains and that trees from common parents may be weak and

strong in one locality

Here science makes the child prove whether his parest is worth perpetuating. Once the strength of the strain in determined, they go back year after year, obtaining pollen and seed with which not only to perpetuate the race but to improve it by crossing with others.

THE ideal timber trees," Austin said, They will combine, for example, the extremely rapid growth of the Monterey with the excellent wood quality of the Slash or Western Yellow pine. They will have highly efficient foliage, making for relatively few branches on the trees and a corresponding examiny of knots in the lumber. They will have a sturdy root system.

"Possibilities for improvement are unbrailed and we should be no more content to keep on many interior wild strains of trees for reforestation than we would be to ceturn to the penginal wild forms of domestic

animals and plants."

But where, usede from restocking our forests, her the value of these efforts, which will continue for several decades?

In the past we have seen grapes, peaches and other fruits developed for their shipping qualities. Just so, improved strains of timber are being bred for different uses. Bridges require wood of great strength and sturdy weather resistance quality. Box makers demand wood that takes nails without splitting Planing miles require wood that is quickly and easily worked. Paper manufacturers want wood whose fibers are long and of good quality.

The demand for wood today is enormous. Each year the milroads use 130,000,000 tles, \$,000,000 trees are cut each year to make telephone and telegraph poles, every Sunday edition of a big city newspaper ents up the pulp wood from sixteen acres. In short, we cut 250,000,000 trees every year, decreasang the forest area 18,500 square miles,

WENTY leading industries depend on wood as their main raw material, fifty ave others re use specialized grades and qualities of lumber. Wood also is needed in the making of a long list of useful products (See page 58). Scientists predict wood will be a future source of motor fuels.

Professor Walter Mu ford, head of the Division of Forestry of the University of California, and President of the Institute's Board of Trustees, estimates that, by producing trees to reach maturity in twenty-five instead of fifty years, the cost will be cut two-thirds, or a saving of \$29,900,000,000 on the nation's private and public timberlands, which total today 400,000,000 arres!

Even to cut ten years off the growing time will reduce the cost hearty half Here are Mulford's figures, bared on five percent compound interest on an investment of \$10 an acre, and they do not include costs of fire

prevention and upkeep

Acre cost at the end of 10 years Acre cost at the end of 20 years 26.53 Acre cost at the end of 25 years 33.56 Acre cost at the end of 30 years 43.22 Acre cost at the end of 40 years 70.40 Acre cost at the end of 50 years 114.67

So, you see, the difference between the cost at the end of twenty-five years and at fifty years is \$80.81 an acre, and the sav-ing on 160 acres to be effected by the ideal tree will be \$12,930. Meantime the land will have produced two crops and two profits within an owner's lifetime.

Four-Ciths of the nation's timberlands," said Mulford, "Is in the hands of private owners, and until the natural handlesp of high costs is overcome there will be no general reforestation, despite such recent encontragements as tax deferments and liberal

offers of stock for planting

"Meanwhile the national timber supply is being consumed more than three times as fast as it is being replaced by new growth Less than one-sixth remains of the virgin forests that once covered had the total area of the United States. Present overproduction makes it deficult to real to the nation is approaching a limber shortage, but even now there exists serious regional shortages in sections that once ranked birth in production."

STATE and federal governments today are attempting to meet this problem, but more than \$1,000,000 acres of devastated timberiands must be restored to production if a balance is to be struck between growth and consumption.

At the best rate of progress yet attained, by all the agencies combined, the task would not be completed until the year 35321 Six-

teen centuries?

But now one can think in terms of forests that reach maturity in a quarter-century Practical men can think and plan on those terms. The discovery and development of improved, faster-growing trees that fit into our scheme of economy will help largely in solving the problem of reforesting acres demided by saw and fire.

SHATTERED MEN REBUILT BY MASTER SURGEONS

(Continued from page 32)

repair of deutate broken and injured nerves A little more than a year ago, a Brooklyn N Y, beer runner was carried to a hospital with his right upper arm shattered by bullets The fractured bone above the elbow knut satisfactorily, but the injury left the wrist and forearm paralyzed. When the patient held out his right hand, palm downward, the wrist dropped and the fingers could not he brought up. These symptoms showed that the large nerve which winds around the arm bone had been severed by the bullets. A sunteen decided to sew the two ends of the nerve together

As I watched him, he wiped the back of the arm with loding and alcohol, injected pain-deadening drugs and then cut into the flesh midway between the shoulder and the cloow. Assistants rapidly stopped bleeding with gause sponger. Pushing his way carefally through tough muscular fibers, the surgeon reached the two ends of the severed nerve. With a steady hand, he placed each end of the nerve in a special device which held it firmly but did not squeeze it. Then, with an extra fine curved needle and black surgical thread, he sewed the tube-like sheaths, surrounding the nerves, together

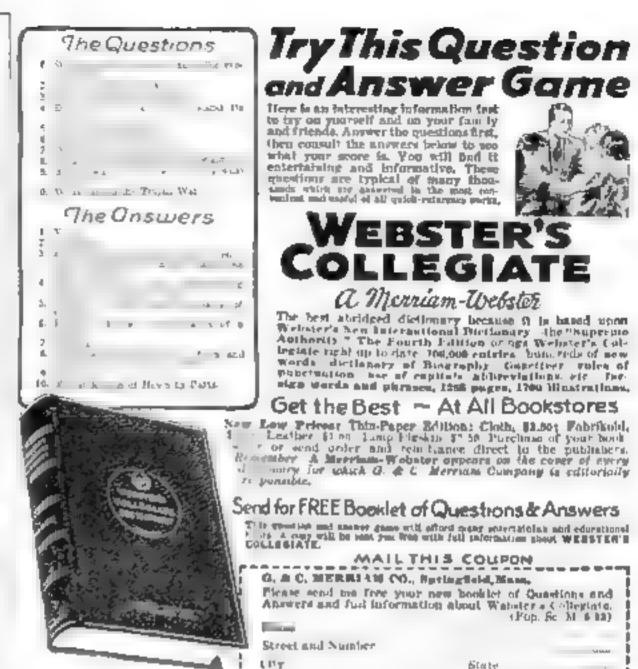
TEN months later, I had an opportunity to see the results of his skilled work The paralysis had completely vanished. The patient could feel perfectly in his band. All evidences of a severed nerve were gone

When I was doing neurological work in the United States Army Medical Corps, during the World Wer, I saw 800 soblers at one time who were under treatment for severed or talured perves. Because the thinwalled tubes that form the sheaths, or manual tion, for the glistening white nerves are easily torn, the work of sewing the ends together to particularly delicate. They must join on actly. The slightest pulling or atract will rip. out the threads and ruin the operation. Only nerves an eighth of an inch in diarnoter or more are joined and even the smallest require ten stitches of the black silk to hold the shraths until they knit

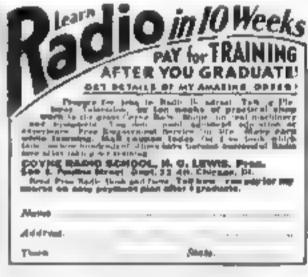
Unike a broken electric wire, which will carry current as soon as it is joined, a severed nerve requires months before it will function again. Below the point where it is cut, the nerve remains dead and a new nerve has to grow down through the sheath as the okl one disintegrates and is absorbed by the bods. The rate at which the new nerve pushes down through the old sheath is approximately an inch a month, or a little more than a foot

a year In cases of incurable cancer, and other types of disease in which the past is great surreces now bring permanent relief by removing the sensory perve leading to the seat of the pain. As the motor nerve is left intact, control over the area is retained. Of all pain, the greatest is that resulting from trifacial neuralgia which affects the main trifacial nerve, running from the brain to the face. So excrumating is it that most sufferers e ther commit suicide or become drug addicts Surgery now removes this nerve, giving the only possible relief. Afterwards, as the nervegrows in, it is destroyed by injections of alcohol within the sheath.

REPAIR work on motor perves in the face is also important. I recall one case in which a three-year-old baby had an abscess in his right ear which broke and severed the right motor nerve that runs from the brain to the face, passing near the lobe of the ear-The child's face, as a result, was drawn far to the left. Unless the nerve could be repaired. he was disfigured for (Continued on page 98)

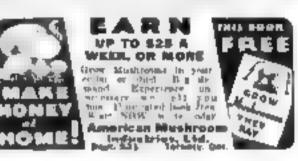








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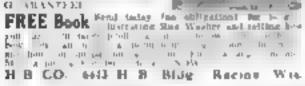


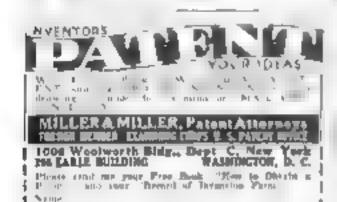
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SHATTERED MEN REBUILT BY SKILLFUL WORK OF MASTER SURGEONS

(Continued from page 97)

life. In an operation that lasted nearly an bour, a surgroun jouned the two ends of the perver and, in six months, the expression of

the face was again pormut

But, the most dramatic bit of nerve repairing of which I have ever heard occurred in a London, England, hospital, several years ago. A large nerve trunk had been severed it a patient's arm by a shotgun wound. Four inches of the nerve were gone, so it was impossible to join the two ends.

The surgeon learned that another patient was to have his leg amoutated the same afternoon at another hospital. Telephone wires azzed bu-1 s. As soon as the leg was amautated, it was placed in a warm salt solution and rushed by taxical to the room where the herve operation was being performed.

When it arrived, it was still warm. The patient was already under the anesthetic Working rapidly, the surgeon took out four inches of a large nerve from the amputated amb and spliced it carefully to the two ends of the severed trank in the arm of his own patient. The result of this operation was a complete success.

Thus, using average nerves and bones and flish as the material with which he works, the specialist performs feats of reconstruction and repair. Such achievements in human carpentry, relatively unknown to the general public, constantly add amazing new miracles to the records of the operating room

IMAGINE a man without a stomack, yet in period keatth! Next month, De. Damesic explains how the margina of today is able to remove whole organs, and restore the patient to health. It is one of the most thrilling articles of this fascinating series Look for it in the April jurie of Popular

MAKING OUR MONEY LAST LONGER

Conserved from page 34.

papers for its currency. For almost fifty veam, a paper finished on both sides and having a silk fiber embedded in it. has been used. Made under strict government supervision, this paper is purchased by a separate division of the Treasury Department, and held in its custody until it is needed

An average of five and one fourth tons of it is needed each day! On it are printed over 3,250,000 currency notes, costing the government, lacluding paper, page tenths of a cent each, but when placed in circulation worth over \$13,250,000

THE Bureau of Engraving and Printing is responsible for every sheet of currency paper that it draws. This comes in realed parkages of one thousand theets, and all through the process of money making checking in continuous

Mout paper is necessary for currency printing, and the first operation is to place the paper in wetting machines, which feed each sheet under a spray of water. Then they are wrapped in moist cloths, placed under bravy weights, and allowed to stand for three or four days, so that the moisture will sink into every fiber. When sufficiently seasoned. the sheets are delivered to the plate printers. who print the backs of the notes. Then they are returned to the Wetting Division, where they go through the same process of wetting and seasoning before the faces of the noteare printed

Both sides granted, the sheets are fed through a machine that coats them with a sering moreture of glue, water, and a small quantity of alum, which below them to resist use and abuse. A later process restores the sheets to the smoothness lost in printing

The last process is numbering and sealing In carefully-guarded from cages, speciallydesigned machines print numbers and reals, cut each sheet into the required number of notes, and count them into packages of 100.

The fact that the identifying numbers and seals must be pranted on the bills as the final step in their manufacture is a serious handica, to ellors to increase the bie of cur currency. It makes impractical the freating of the surface of the paper, as the application of the resistive coating must be made before the final stage of production has been reached

Each afternoon, every sheet of currency paper, and every note, must be accounted for before the 4,000 employees are permitted to leave the Bureau. The checkang and accounting system used is so comprehensive

that it is possible for Bureau officials to learn from their records the name of every emplayer who had a hand in the production of any given bill of the millions that are protect each year

Most of us confine our interest in our paper currency to the denomination figures printed on it. Few of us realize that there are seven clames of paper money in circulation, although only five classes now are being printed. and insued-United States notes, gold certainrates, savez certabrates, Federal Reserve notes, and National Bank notes

It was from the United States notes, orlidnally issued during the Civil War, that our parser money got the nickname of "green as go". There is \$140,000,000 worth of the currenty. outstanding. At present these notes are issued in denominations of \$2 and \$5 only Gold certificates are fasued in denominations of from \$10 to \$10,000—the latter being our highest-priced piece of paper maney Silver certificates range from \$1 to \$100. Federal reserve gotes start at \$5 and go up to \$10,000. National Bank notes at present are being tossed in denominations from \$5 to 5100,

Some Treasury notes of 1800, and some Federal Reserve bank notes still are in circulation, but they are bring retired and destrayed as rapidly as they are presented for redemption. It is old that there are \$1,250,000 dollar bills of the page of 1890 Hill outstanding, although some has been placed in circulation for over thirty years. The only plausible explanation of this record-breaking longevity is that they are being hearded

The change to the present small sized currency was talked of for twenty years before it was made. Decided on, it was delayed by a change in the administration. Decided on again, it was held up by the World War It was decided on for the third time early n January, 1929, and the date of issue set tor July 10 of that year

AKING the change was a back breaking NI task for the Bureau of Engraving and Printing Director Hall says that it gives him a headache just to remember it. But after a couple of months of steady effort, everything seemed to be going smoothlyuntil it was found that the new numbering machanes wouldn't work. After weeks of feverish effort, they were adjusted and printing began. The initial issue was 158-500,000 shrets-702,000,000 notes! And every note had been delivered to the banks in time to ge into circulation on July 101

KEEPING YOUR RADIO FREE OF NOISES

(Continued from page 61)

interference before it has a chance to reach the inner wire which connects the antenna to the receiver. To be effective, the shirking must extend over the entire length of the lead-in, from the antenna to the receiver

A shielded lead-in however, may thuse an appreciable loss in signal strength, especially when the wire is unavoidably long. It also tends to broaden the receiver antenna selective y

To meet the demands for a threfully designed, low-loss, interference-free lend-in radio engineers have devised special antenna systems consisting of a shielded lend-in wire and two impedance matching transformers

One of the transformers is placed at the antenna and is connected to the antenna wire. The second transformer is placed at the receiver and connected to the ground and antenna binding posts and the shielded lead-in is connected between the two transformers.

THE antenna transformer, being a voltage reducing device, lowers the voltage and reduces the loss in the lead-in. When the signal reaches the receiver transformer it is boosted back to near its original value. The two transformers greatly reduce the transmission losses and make it possible to use a sheeded lead-in without any appreciable loss in signal strength.

One system of this type uses a receiver transformer having two impedance taps. One tap is used for matching receivers having a low impedance input circuit and the other tap serves for receivers of the high impedance

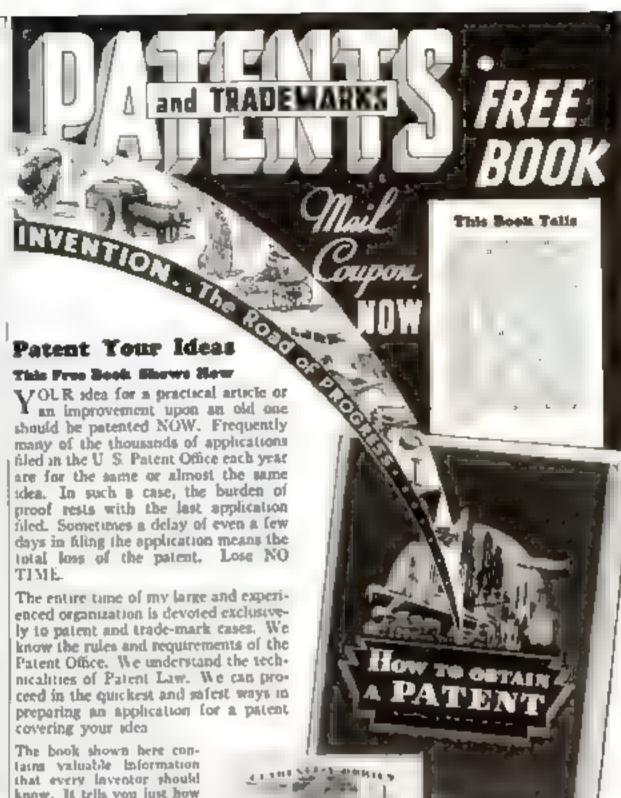
With these lead-in systems, the placing of the antenna is no longer a problem. It can be arranged for best interference-free results regardiese of the location of the receiver. The read-in moures against interference entering the circuit between the antenna and the antenna binding post at the receiver. Although best noise-free results are obtained when a perfectly shielded receiver is used, the shielded lead-in measurably improves reception with any receiver.

Equal in importance to the anienna system and receiver is the ground. The temptation, when installing a receiver, is to connect the ground wire to the nearest water pipe without considering the path the pipe takes before reaching the actual ground. If it is convenient and does not necessitate a long lead, run the ground wire to a point where the water pipe enters the cellar wall.

Loose ground connections are always a source of noise. Unless the pipe to which the ground is connected is scraped clean, down to the shiny metal, corrusion as bound to set in and the receiver will develop queer scratchings that will speil reception.

FIND FOOTBALL MOST STRENUOUS OF GAMES

FOOTBALL demands more exertion from a player during the sixty minutes of a game, than any other of a large number of sports and forms of exercise, according to a recent investigation at Harvard University, Blood tests made on members of the Harvard footbull team before, during, and after games showed the effect of their tremendous output of energy by the rise in the number of white cells in the blood. These cells, which combat fatigue, were shown to be called forth almost solely by exertion, and not by excitement, as some experimenters formerly believed, tests on excitable spectators showed no similar oversupply of white corpuscies, while athletes exhibited as great a profusion after practice scrimmages as following the play before a packed and cheering grandstand



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DON'T STARVE YOUR CAR'S BATTERY

(Continued from Page 62)

a long trip," Harry asked, after instructing Gus to put in a rental battery and a new set of battery cables.

"Sure, you can reduce the charging rate in most cases," Gus agreed. "But the easiest way is to burn your lights when you go on a lang drive. The additional drain will prevent over charging.

"But I thought every car generator had n cut-out that switched the generator out of the circuit when the battery was charged,"

Cummings objected.

"Generators have cut-outs, but they don't work that way " replied Gus, "Cut-outs are automatic switches that cut the generator out of the circuit when the car is running to slowly that the generated vultage is less than the battery voltage. On most cars, the generstor begins charging at twelve miles an hour and decreases at twenty-five miles an hour "

"Well how can a punk mechanic like me tell when his electrical system is working as It should?" Harry inquired as he watched Gus lift the cental battery into place, "It most o the drivers in the world are as dumb as I am, they never think twice about the battery, much less the generator,"

PRATS that was with most car owners." (ign chucked "It is a rase of out of sight, out of mind.

"It's a cinch to check up on your generator. All you've gut to do is make use of that mine er pa ur a bhoard. With the motor of and your light on jot love the regions of the ammeter. (If course, it will show on

the decharge was of the claid. They wish your car running at fifteen miles an house and your lights if take a second reading. This should show on the has ke side of the owner. When you compare both readings the second one should a little more than the first, Most generators are adjusted to give their greatest output at fifteen or twenty miles an hour so by making the lest at that speed you get the greatest

Sounds easy enough," Harry agreed, "but what I want to know is how I could have located that short before anything happened."

"Well, in the first place," explained Gus-"you pusht to take better care of your bat tery. A battery coming from the manufacturer is as perfect as it can be made and if it gives up before its usual span of life you can charge it up to neglect on your part

"A battery is just like a human being. If it doesn't get enough food, it gets weak; and if it gets too much, it gets sick. Most battery (roubles can be traced to neglect--lack of water, undercharging, or overcharging."

BY THIS time, Joe Clark had returned and was helping trus connect the new pattery gables

"The best way to take care of a battery," Gus continued as he took the wrench Joe handed him and tightened one of the battery termsmals, "in to do it periodically, Test your battery every two weeks with a hydromrter. In order to make it a habit, do it on the first and fifteenth of every month. If a cell reads much below 1 250 on two sucreserve testing dates, get the battery tested al a service station.

"Always test all the cells to make sure each one is healthy and most important of all, don't add anything but distilled water."

"But, Gus," Cussmings interropted, "the solution in a battery is made up of water and acid, isn't it? How come you don't have to add some acid non and then?"

"If the battery is in good condition," Gus replied, "the only mason for losing any solution is evaporation, and the acid doesn't

evaporate. All you've got to do is replace the distilled water to keep the solution at the proper strength. Of course, if you lose some of the solution through a leak, you'll have to add acid and water accordingly

"Speaking of leaks," continued Cut, "any leaks in your electrical system will drain your battery too and make it weak, So besides testing the battery periodically you should test your wiring as wel."

"Isn't there some quick way to test the whole system for short circuits?" Harry

"There is, and it's almost as simple as thecking the air in your tires," said Gus as he reached for a file. "Joe and I can show you how in a july."

"HE two garage men board themselves with the head ights and cowl lamps as Harry Cummings looked on.

The first step is to turn on all your lamps and remove the bulbs," explained Gus as he worked, "Then disconnect one of the battery cables and hold one end of a course file against the free terminal post on the batter har this. Next, rub the unconnected cubic end along the file. If sparks are noticed, there's a ground in the wiring. From the looks of this," Gas said indicating the absence of sparks on the surface of the file he was holding in his left hand. "I deay that those new battery caldes fixed up the only short you had. You know, every short won't be as rasy to find as the one that caused your trouble, but none-tenths of the shorts that are found in cars are caused by worn-out battery cubic-

"And there's one more thing," Gue added. "If you do much driving in real cold weather always start the motor before adding the

distilled water

"Water floats on acid, you know, So It you pour it in and let it stand, it may freeze Running the motor fast enough to charge the battery, however, makes the solution circulate around. Once the water has mixed with the acid there isn't much danger of freezing. Of course, in very cold weather, it's sometimes whe to keep the specific gravity of the solution up to 1 275."

"There's more to this battery business than I suspected," Cummings confesse as he waited for Jos to slide back the doors of

the gurage

"Just remember one thing," Gus called "Your battery is probably all right when you buy it and you can keep it that way for quite a few months if you'll only take moderately good care of it "

LOUD VOICE TO SHOUT WARNING TO SAILORS

A DIART voice booming "Partridge Island I Partridge Island!" may soon help guide for-bound mariners arrow the Bay of Fundy to a safe harbor at St. John, New Brunswick. Development of a talking fog signal, to be installed experimentally in the Partridge Island Light at the harbor entrance, is announced by J. C. Chesley, inventive Canadian marine official who originated the idea. The voice of the robot device, now being worked out at a marine appliance factory, will be produced by a steel phonograph record and projected with the aid of powerful amplifiers so that it may be heard for miles. If the seenal proves successful, as recent advances in the amplification of sound suggest, the present system of identifying a station by the number and timing of blasts on a sirco may be outmoded, it is expected that the spoken word will be more easily understood.

MOVIE AMATEURS USE CLEVER TRICKS

(Continued from page ag)

From the miniature workshop where Knoblock and Babb were filming their masterpiece, I went to the studios of other amateurs, whom I found using many elever devices in their effort to achieve professional effects

One unusual project was the filming of "Black Revenge!"—a sound picture made by Fenton Earnshaw, a Los Angeles university student. All scenes were taken outdoors, and the actors were directed not to face directly into the cameras, to avoid possible lip-reading by the audience. The dialogue and sound effects, added later, were so accessful that pro examines who saw the picture were amazed.

A SIG-GAME hanting comedy, "Africa Squeaks," had just won W. J. Scaman a prize in an amateur contest. In this firm shot chiefly in a nearby dry river bed, with some with animal shots from a 200, a gorn to pursued actors through many amusing scenes, and acting aimost human, performed incredible feats. Scaman let me into the secret by showing me a home-made gorilla suit with body made from a bearston tust, the head, which was almost unbelievably realistic, moulded from rubber. The mouth, which could be opened or shut at will, had a full set of rubber teeth, casved with a sharp limite.

One scene where the gorida leaped from the ground the a tree was faked simply by having the gorida jump down from the branches while the camera was cranked in reverse. In another, the honter, while reading in his correspondence course on big-game hunting the chapter on "The Good and Bad Habita of an Ostrich," repealedly had his cork helmet knocked off by an ostrich which tooked out of a bush to read over his shoulder. The ostrich head was in readily a dummy made so as to be shipped like a glove over the arm of a person concealed in the bush.

To make dolly shots, in which the camera, starting from long shot position, is wherled toward the actors to make a close-up of an individual who is speaking, gameramen at the University of Southern California have been using a dolly improvised from a rubbertured toy wagon, with an upright post to which the consern is acrewed. The cameraman mounts the wagon and applies his eye to the finder, while his assistant grasping the wagon-tongue, pushes the dolly forward for the classe-up.

ALTHOLGH some amateurs shoot their pictures as they go along, trusting to luck an directory assembling to make the story come out right, the more experienced, with an eye to economy, organize their production methods. The story is broken down into its constituent shots, scenes taken with the same settings being grouped. Early shot is any yield to get the best possible camera angle and acquence of action.

Then friends and members of the family are drasted as principals and extras, rehearsed in their parts, and actual shooting done, frequently with the producer acting as director cameraman, prop boy script girl, and even doubling for a member of the cast

Developing and processing, usually done by the film manufacturer, is followed by cutting and edit us. The fam is inspected with the aid of a strong light, or by actual projection, and critical eyes determine where such bit of action should begin and stop, applying the acissors to this purpose. The sections of film are pianed up on a clothestine, coiled and hung on mails, or rolled tightly and tucked into the compartments of an egg box, each with a number to identify the shot. Titles are then inserted at necessary points to capian details of the plot, (Continued on page 102)



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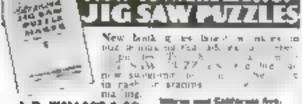
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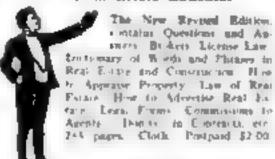
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MOVIE AMATEURS USE CLEVER TRICKS

(Continued from page 101)

and the hits are spliced together with coment Many are the ingenuities practiced to break be monotony of the subtitles. Usually the desired information is printed upon a black card, which is then set up before the camera and photographed. By rewinding the film and shooting another scene on the same negative, the words may be superimposed upon a background of action

Another stunt is to use individual paper letters, arranged on a flat board with the camera above in vertical position. A few feet of film are shot on the title, with reverse camera cranking, then a vacuum cleaner hose sucks away the paper letters. When the film is projected the letters seeming appear out of space and form themselves into the completed title.

Still another method is to write the letters in wax on a metal sheet, then to pass a candle underneath, melting the wax and rendering it invisible. This process, too, is photographed in reverse to that the film shows the letters materialize out of the air to spell out the title.

BITS of 6km cuttings saved from old pic-tures often provide needed bits of action, An exceedingly clever example is a feature produced by F. B. Sheels, a Los Angeles amateur, under the title of "Bear Hunt to Africa." The plot concerns the adventures of his two small som on a mythical bearbunting trip to Africa. Subtitles are in the form of notes being written as they relate their experiences on their return.

Although the picture is 400 feet in length only ten feet were shot especially for the story, all the rest bring pieced together from odds and ends of film at hand and eleverly joined logether by a continue's written for THE TOTAL THE SHARK INFESTED WATERS OF THE SOUTH SEAS"- a series of close-ups of goldfish in the aquarium, "ALL LOS ANGELES TURNS OUT TO GREFT 15 ON OUR RETURN"-pictures of a parade in bonor of a returning football from, and a final close-up of the trophics of the hunt-a large teddy bear, with a slingshot, their weapon, on the ground beside it

About 300 amateur movie clairs are scattered over the I miled States. Southern Call forms alone has an estimated 15,000 amateur movie-makers. Foreign countries, for have their Little Hollywoods, with I-naised and Japan Incomest

NEWS WILL BE FLASHED ON ENGLAND'S CLOUDS

Soon Englishmen may read a sky newspaper. Plans have been completed to project news articles in condensed form upon London's evening clouds, with the aid of powerful searchights. The projectors are of the type used successfully for skywriting advertisements, and these will continue to be interspersed with the news broadcasts. When the clouds hang at a level of about 2,000 feet, the sky measures are expected to be visible to m lions

FIND DESERT SNAKES "SWIM" UNDERGROUND

STRANGE stakes that "swim" underground, in the soft sands of California deserts, have been observed by Dr Walter Mosaner, Cali-fornia soologist. Streamlined heads and bodte permit them to disappear with amazing wiftness, and to proper themselves along just below the surface of the loose sand. thus giving the suggestion of swimming exactly like fish in water

RIDING THE NIGHT PATROL WITH THE RADIO POLICE

(Continued from page 15)

watched things pop in this round tower room with its guilded doors. Perched on the roof of police headquarters, it is the heart of the radio patrol. Direct lines connect it with the other stations, The WPEG announcer, ordinarily sends out the alarms from all three stations, one after the other, repeating each announcement twice. But in an emergency, men on duty at WPEE and WPEF can broadcast calls independently. At all stations, the tubes are kept burning continually so there will not be an instant's delay getting on the nic.

BETWEEN the arms of a huge U-shaped table, covered with an enlarged map of the city, stands the dispatcher, recording the movement of the cars. Red and green cords, tacked in place, divide the map into precincts and districts. Above the sector patrolled by each car is a round brass checker with two domino dots and the number of the machine indented in each side. On one side, the number and the dots are black; on the other, white. The checkers are white-side-up when cars are on patrol; black-side-up when they are making a run. This system prevents giving a cur a second call before it finishes

When a muchine is out of service for radio repairs, a brass ring is placed around its checker until it returns to patrol. If the caris stopping for gasoline or oil, the checker is placed on edge inside the ring. If the machine is out of service indefinitely from a crash, the checker is removed and the ring is left in its place. The crash hazard is greatest in winter when motorists have their windows up and may fall to bear the siren. But streetcars, as a hale-raising experience later that night taught me, are worst of all. A motorman, in a rattling car with the windows up, rarely hears a siren until the radio cars are virtually on top of him.

For more than an hour, we patrol back and forth, then pull up at the curb before a restaurant. There is a lull to the activity of the loudspeaker.

"All quiet on the western front," grins Waldren as he climbs out for a cup of collecand a sandwich. The others join him while Dolan and I stay in the car.

Five minutes go by. Suddenly, the loudspeaker jumps into action !

"Calling cars 1214, 1215, 65. Go to 2000 Broadway. Signal 31."

Dolan Jota down the address and I jump to get the other men. They come on the run. As the car lurches ahead, they are still complaining about the acres of half-eaten sandwiches and the lakes of coffee they have left in restaurants.

'HE siren in screaming. We are weaving in and out of dense traffic. A motorist nhead slams on his brakes. We miss clipping him by Inches.

The lights are with us and we touch sixty miles an hour. Traffic ahead clears at the sound of our airen-all except a coupe containing a man and a girl. It sticks to the middle of the road until at the last record, the driver bears the siren and scoots for the curb. Kennedy growls: "There ought to be a law against men and women riding in the same car,"

Then the siren stops. It is always shut off at least four blocks short of the destination so crooks will not be warned. We grand to a stop and see the two precinct machines parked at the curb. Kennedy snorts: "Look at those Dolly cars. They're thick as gnats. They get in your eyes,

Upstairs, in a beauty parker, the chalkyfaced manager is (Continued on page 104)





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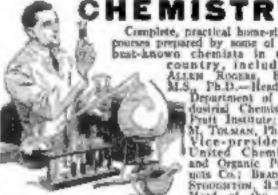
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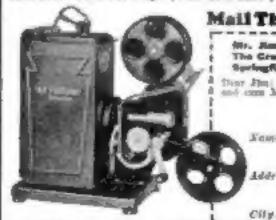
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Riding Night Patrol With Radio Police

(Continued from page 101)

relating how he was counting the \$250 in the cash register, when he heard sumcone coming down the stairs. The week before, a fire had cleaged out the floor above, leaving It open to any thicf who climbed the fire escape. He had run around, seen two legs disappearing up the stairs, and had phoned for the radio cars.

With the hig searchlight held away from his body, Dolan mounts the steps. The others follow, right hands in outside pockets. For fifteen minutes, they coush the upper floors and the roof. Then they come down, The frightened thief apparently scuttled down the fire escape and made his getaway before the manager had unished sending in the alarm.

'VEN when a crook escapes, the speed with E which the radio care swoop down on the spot he has just left, makes him pause before taking another chance. Every radio alarm means a close shave for an escaping criminal and is a deterrent of crime. Again, the splitsecond arrival of the cars often stops a quartel before it reaches the murderous stage,

The biggest haul made by the New York patrol was a \$15,000 silk truck; the small-cst a five-cent package of gum. The latter capture resulted from a broadcast that someone was crawling in the fourth story window of a candy factory. Detectives collared a tenyear-old boy who had scaled a six-story building next door to enter the factory in search of sweets. All he had found when the police arrived was a package of gum.

Last summer, an epidemic of false alarms was traced to a nineteen-year-old boy. On the day the crew in Sixty-five caught him, he had called the radio cars, an ambulance, and the fire department to the same corner at the same time.

Whether a call is a false one or a "heavy heep," it is always handled with the same care. For, Dolan tells me, a maxim of the

"The call you get careless on carries the wallop."

As we are rolling back downlows, the "The time, 11:30 P.M. The time, 11:30 P.M. Station WPEG. Station WPEG."

ON EVEN and half hours, the time is brondcast as a check upon the radio sets. If half an hour goes by without a time signal coming through, the man in charge of a car calls headquarters and a radio repairman is dispatched to examine the set. These high-speed trouble-shooters ride in light. blue-green trucks fitted with testing equip-ment, tool-boxes, spare sets and batteries.

A little after midnight, I see another pervetingling phase of the patrol work-stopping suspicious cars and searching them for guns. A car with elz men in it, and its motor running stands at the curb in front of an allnight restaurant.

"They don't look so good, Let's give them a toss," Waldron suggests. Dolan nods. Sixtyfive slides noiselessly abreast of the other machine and then cuts in at a sharp angle ahead of it. A metal plate tinkles against the windshield. It is labeled POLICE to keep the

detectives from being mistaken for bandits. Before the wheels of Sixty-five stop rolling, the men are surrounding the other car. Dolan is courteurs, but takes no chances. After the occupants are searched, the men look under the seats and even lift the hood. The latest ruse of the underworld is a compartment hidden under the seat or hood of a car for holding guns. One machine, captured by Sixty-five, was equipped with a take radio,

all wired up, holding three revolvers.
Since the start of the patrol, Dolan and

his men have taken eighteen guns. Only a few nights before, they got five at once when they stopped a bandit car containing four men with a record of twenty-three stickups. All were armed and one had two gues, one up his sleeve.

IT IS after one A.M. when we swing past a blood-red neur sign before a drug store. It was here that the "Baby-Killer Bandit," Vincent Coll, was riddled by gangland bullets as he talked in a telephone booth. We are heading north again, when the attention note screeches overhead!

B-e-e-e-p! Calling cars 1206, 1207, 65. Holdup at garage at 401 Ninth Avenue. SIGNAL THIRTY."

"That's the same garage where the Coll mob kept their car," volunteers Salamone as we swerve into a side street and race across town. We are only four blocks away and Kennedy cuts in under the elevated and jerks to a stop in the doorway of a low garage, painted green and yellow. The other cars have not arrived.

A few minutes before, two men had walked briskly into the garage, shoved automatics into the stomach of the negro washer in charge, locked him in the office and sped off in a yellow roadster just left by a customer.

"We'll bear from that haby before the night's over," predicts Waldron. Almost every big boldup, nowadays, is preceded by an auto theft to provide for the getaway.

Dolan is taking the number of the stolen car from the office record-book. He puts in a quick call to WPEG. The negro washer



This transmitter is the heart of the radio police service, as it sends out all orders to the 300 cars

is badly frightened and he keeps wailing: "Now I got to call up the boss and tell him the car's gone,"

We are dashing for Sixty-five as the Dolly cars wall up. The bandits have beaded south and far ahead, we see a car flickering in and out of the street lights. It is traveling at high speed. Before we can close the doors, Kennedy is jerking the car around.

AS WE gain speed, over the loudspeaker comes the message describing the car and giving the license number. Only thirty seconds have elapsed since Dolan finished phoning in this information, yet, already, every machine on the radio patrol has been warned to keep a sharp lookout for this car.

Elevated pillars, black and white, are streaming by. For twenty blocks, they form a narrow lane of steel. We seem racing down a tunnel, the rows of pillars on either hand, the dark tracks of the elevated overhead and beneath, the gleaming, slippery mile of the surface our track. The alightest skid will rocket us into the pillars on either side,

Everything is deather still inside the cur-The speedometer hand is rising higher and higher. The tiny red dot of the other car's tail-light is slowly growing larger. We are

Two blocks away, we suddenly catch a glimpse of a streeter bumping across town with its windows closed. Unless the motorman bears sa, his pace will carry him directly in our path. On the slippery rails, we cannot stop. Hemmed in by the steel pillars, we cannot swerve to either side.

The high-pitched sizen is screaming at the top of its voice. Only when the blunt green nose of the trulley has actually poked past the left-hand line of pillars does the motorman hear us and slam on the brakes. I catch a fleeting glimpse of his scared white face as we streak by.

At every block now, the car ahead is growing in size. We can see it is a light-colored roadster. All around me, the men are leaning forward, right arms bent, hands sliding into revolver pockets. Suddenly, the roadster slows down and swerves into a side street, angling to the left. The men have their hands on the doors, ready to jump. We are closing in. The moment has all the tense menace of going over the top at the zero hour. For these men, it's always this way. One ride with the radio patrol, and your respect for the police increases a hundred percent.

HE yellow roadster gips under a streetlamp. A white face peers back through the rear window. Two black streaks shoot from the car into the weeds of a variant lot. Cornered, the bandits are getting rid of their automatics. A moment later, their muchine tries to twist into a side street at high speed. It careens on two wheels, slices past a lamppost, bounces, out of control, over a curb, crashes at an angle into a brick wall and grates to a stop.

A short man in a gray coat leaps from behind the wheel and races for an alley. The men are tumbling out of Sixty-five, guns in hand. Dolan's roar: "STOP!" carries for two blocks. The running man flashes a look back over one shoulder and halts, hands in air. The game is up, His companion, knocked out by the crash, is coming to. Expertly, Dolan and Salamone go over them for other weapons. From the loudspeaker coases a calm voice;

"The time: 2:01 A.M."

Waldron, with the searchlight, goes back for the discarded automatics. When he rethe rear sent with Dolan and Salamone, I climb in front with Waldron and we head for the nearest precinct station,

Later, when the men were shaking hands with me at the end of the tour, Dolan remarked a little apologetically

"Well, I'm afraid it's been a pretty tame

I stared at him. He wasn't joking. He meant it. For, to these riders of the night patrol, drama, action, color, thrills are just part of the job. Their's is a hazardous business, a nerve-tingling game. But it is more than that. By combining courage with science, their work is bringing about a new era in police methods, a split-second efficiency which means greater protection for the public,

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A SISTER SPEAKS OUT

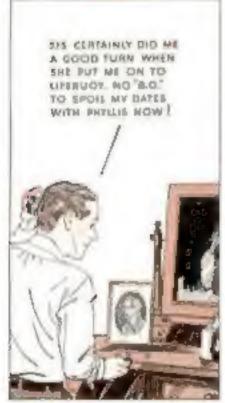


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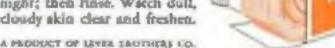


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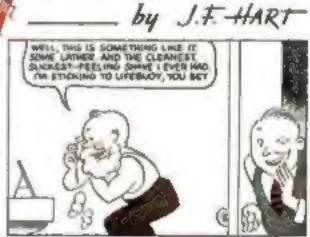




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